

**EPA Superfund
Record of Decision:**

**MIDCO I
EPA ID: IND980615421
OU 01
GARY, IN
06/30/1989**

THE ORIGINAL RELIEF OF THIS SITE, AS WELL AS THE SURROUNDING AREA, INCLUDED ALTERNATING EAST-WEST TRENDING RIDGES AND SWALES. ORIGINALLY, TWO SWALES CROSSED WHAT IS NOW THE MIDCO I SITE. HOWEVER, THE TOPOGRAPHY OF THE SITE AS WELL AS OF THE SURROUNDING AREA HAS BEEN MODIFIED BY MAN TO A GREAT EXTENT AND IS ONLY LOCALLY PRESERVED. THE SITE ITSELF IS NOW LEVEL AND IS UNDERLAIN BY SANDY SOIL. A SURFACE REMOVAL ACTION WAS COMPLETED IN 1982 TO REMOVE ALL WASTES IN DRUMS, TANKS AND THE TOP ONE FOOT OF CONTAMINATED SOIL. THE REMAINING CONTAMINATION OF CONCERN IS IN SUBSURFACE SOILS AND MATERIALS, AND THE GROUND WATER.

ECOLOGY:

THERE IS EVIDENCE OF THE ORIGINAL RIDGE AND SWALE TOPOGRAPHY JUST NORTH OF THE SITE. DESPITE THE INDUSTRIAL AND COMMERCIAL USE OF THE LAND, MUCH OF THE AREA AROUND THE SITE CONTAINS WOODED AND PONDED AREAS THAT PROVIDE HABITAT FOR FISH AND WILDLIFE. A RELATIVELY UNDISTURBED WETLAND AREA APPROXIMATELY 1000 FEET NORTH OF THE SITE AND SURROUNDING THE NINTH AVENUE DUMP SUPERFUND SITE HAS BEEN DESIGNATED BY THE US EPA AND THE US ARMY CORPS OF ENGINEERS AS UNSUITABLE FOR FILLING BECAUSE OF NATURAL RESOURCES VALUES. HOWEVER, THE MORE DISTURBED WETLANDS CLOSER TO MIDCO I HAVE NOT BEEN SO DESIGNATED.

THERE ARE A NUMBER OF RELATIVELY UNDISTURBED, STATE-DEDICATED NATURE PRESERVES WITHIN THREE MILES OF THE SITE. THESE AREAS AS WELL AS OTHER RELATIVELY UNDISTURBED SITES, PROVIDE HABITAT FOR A WIDE VARIETY OF MIGRATORY AND RESIDENT WILDLIFE. THE SOUTHERN END OF LAKE MICHIGAN AND NEARBY HABITATS ARE A CONVERGENCE AREA FOR MIGRATORY BIRDS FOLLOWING THE NORTH-SOUTH BOUNDARIES OF THE LAKE.

HABITATS NEAR MIDCO I SUPPORT A VARIETY OF FISH AND WILDLIFE POPULATIONS. NESTING MALLARDS WERE OBSERVED IN WETLAND HABITATS BETWEEN MIDCO I AND NINTH AVENUE DUMP. THE MALLARD HAS BEEN DESIGNATED AS SPECIES OF SPECIAL EMPHASIS BY THE US FISH AND WILDLIFE SERVICE. OTHER BIRDS SEEN IN THE AREA WERE SPOTTED SANDPIPERS, KILLDEER, GOLDFINCHES⁰ AND RED-WINGED BLACKBIRDS. MIDCO I IS ALSO WITHIN THE RANGE OF THE FEDERALLY-DESIGNED ENDANGERED INDIANA BAT.

IN ADDITION, THE FOLLOWING STATE OF INDIANA-DESIGNATED ENDANGERED SPECIES WERE OBSERVED NEAR MIDCO I: THE AMERICAN BITTERN; BROAD WINGED HAWK, MUDPUDDY AND FRANKLIN'S GROUND SQUIRREL. ONE DEAD GREY BIRCH WAS OBSERVED, WHICH IS ON THE INDIANA THREATENED PLANT LIST. THE PONDED AREA 400 FEET NORTH OF THE SITE CONTAINED GREEN SUNFISH, BLACK CRAPPY, MUDMINNOW, CARP, BLACK BULLHEAD, CRAYFISH, AND SNAPPING TURTLE.

GROUND WATER:

THE MIDCO I SITE IS UNDERLAIN BY TWO DISTINCT AQUIFER UNITS. THE SANDY SURFACE DEPOSITS, ABOUT 30 FEET IN THICKNESS, COMPRISE A SURFICIAL UNCONFINED AQUIFER (CALUMET AQUIFER) WITH A SATURATED THICKNESS OF 20 TO 25 FEET. THIS AQUIFER HAS GOOD YIELD POTENTIAL AND IS VERY SUSCEPTIBLE TO CONTAMINATION FROM SURFACE SOURCES BECAUSE OF THE HIGH WATER TABLE AND THE VERY PERMEABLE SANDY NATURE OF THE SURFACE SOILS. A 110-FOOT THICK SEQUENCE OF SILTY CLAY AND SILT LOAM TILL SEPARATES THIS AQUIFER FROM A BEDROCK AQUIFER OF THE SILURIAN AGE. AVAILABLE SPECIFIC CAPACITY DATA SUGGEST THAT THE TOP FEW HUNDRED FEET OF THIS AQUIFER HAS LIMITED YIELD CAPACITY.

THE DIRECTION OF GROUND WATER FLOW IN THE CALUMET AQUIFER IS TO THE NORTH AND NORTHEAST FROM THE SITE AS INDICATED IN FIGURE 3. THE RATE OF GROUND WATER MOVEMENT IS ONLY ABOUT 70 FEET PER YEAR BECAUSE OF THE VERY LOW HYDRAULIC GRADIENT. AN ESTIMATE OF THE VERTICAL FLOW RATE THROUGH THE CLAY CONFINING LAYER IS 2 FEET PER YEAR.

ACCORDING TO AN ONGOING UNITED STATES GEOLOGICAL SURVEY STUDY, THE GROUND WATER MOVEMENT IN THE CALUMET AQUIFER IS LOCALLY AFFECTED BY DITCHES AND LEAKY SEWERS. THE GROUNDWATER DISCHARGE TO DITCHES AND LEAKY SEWERS OFTEN CAUSES A FULLY PENETRATING EFFECT ON THE FLOW IN THE AQUIFER. A CITY OF GARY SEWER IS LOCATED 2700 FEET NORTH-NORTHEAST OF THE SITE IN THE DOWN GRADIENT FLOW DIRECTION FROM THE SITE (FIGURE 1). IT IS NOT KNOWN WHETHER THIS SEWER IS LEAKING, BUT ITS MANHOLE DOES DRAIN THE WETLAND EAST OF NINTH AVENUE DUMP DURING HIGH WATER CONDITIONS.

THE PREDOMINANT SOURCE OF WATER FOR BOTH POTABLE AND NON-POTABLE USES IN THE MIDCO I AREA IS LAKE MICHIGAN. IN SPITE OF THIS, THE WELL INVENTORY CONDUCTED IN THE REMEDIAL INVESTIGATION IDENTIFIED 68 PRIVATE WELLS SCREENED IN THE CALUMET AQUIFER WITHIN APPROXIMATELY ONE-MILE OF MIDCO I. THIS INCLUDES 16 WELLS POTENTIALLY IN THE DOWNGRAIENT GROUND WATER FLOW DIRECTION FROM THE SITE; TWELVE OF WHICH ARE USED FOR DRINKING.

SURFACE DRAINAGE:

SURFACE WATER LEVELS ARE INTIMATELY RELATED TO GROUND WATER LEVELS IN THE SURFICIAL AQUIFER. SURFACE WATER DRAINS INTO THE WETLANDS NORTH AND EAST OF THE SITE. IT WAS ALSO OBSERVED THAT CONTAMINATED GROUND WATER

FROM THE SITE SEEPS INTO THE ADJACENT WETLANDS EAST OF THE SITE. MOST OF THE TIME, THERE IS NO DISCHARGE FROM THESE WETLANDS. HOWEVER, DURING THE SPRING MELT AND PERIODS OF HEAVY PRECIPITATION, SURFACE WATER MIGRATES SLOWLY NORTHWARD THROUGH WETLANDS INTO THE WETLANDS SURROUNDING 9TH AVENUE DUMP. DURING PERIODS OF HIGH WATER LEVELS, THE WETLANDS SURROUNDING 9TH AVENUE DUMP DRAIN INTO THE SEWER SHOWN IN FIGURE 1. THIS SEWER LEADS TO THE GARY WASTEWATER TREATMENT PLANT.

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II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

MIDWEST SOLVENT RECOVERY (MIDCO I) BEGAN INDUSTRIAL WASTE RECYCLING, STORAGE, AND DISPOSAL AT THE SITE SOMETIME PRIOR TO JUNE 1973. THE MIDCO I SITE WAS USED FOR DISPOSAL OF A VARIETY OF INDUSTRIAL WASTES INCLUDING UNKNOWN QUANTITIES OF BULK LIQUID INDUSTRIAL WASTES. WASTE HANDLING METHODS INCLUDED OPEN STORAGE AND STOCKPILING OF 55 GALLON DRUMS.

IN NOVEMBER 1973, AN INDIANA STATE BOARD OF HEALTH (ISBH) INSPECTOR ESTIMATED THAT 6000 TO 7000 DRUMS WERE STOCKPILED ON THE SITE. LATER, INSPECTIONS BY ISBH NOTED EVEN MORE DRUMS ON THE SITE AND DRUMS IN A STATE OF DISREPAIR.

FOUR BULK TANKS RANGING FROM 4,000 TO 10,000 GALLONS EACH WERE ON SITE IN MID-1976. THE LEAKAGE OF DRUMS AND BULK TANKS ON SITE HAS BEEN DOCUMENTED. A LARGE PIT ON SITE WAS USED FOR DISPOSAL OF INDUSTRIAL SLUDGES AND RESIDUES.

ON DECEMBER 21, 1976, A FIRE BROKE OUT AT MIDCO I. AN ESTIMATED 14,000 DRUMS OF CHEMICAL WASTE BURNED IN THE FIRE, CAUSING EMISSION OF TOXIC FUMES. SHORTLY AFTER THE FIRE, MIDCO OPERATIONS WERE RELOCATED TO 5900 INDUSTRIAL HIGHWAY, GARY, INDIANA, OPERATING UNDER THE NAME MIDWEST INDUSTRIAL WASTE DISPOSAL COMPANY, INC. (MIDCO II). ACTIVE OPERATION WAS RENEWED AT THE MIDCO I SITE IN OCTOBER 1977 WHEN IT WAS TAKEN OVER BY INDUSTRIAL TECTONICS, INC. (INTEC).

ON FEBRUARY 24, 1978, THE LAKE COUNTY CIRCUIT COURT ORDERED THE OPERATOR OF MIDWEST SOLVENT DISPOSAL COMPANY TO REMOVE AND PROPERLY DISPOSE OF THE FIRE-DAMAGED DRUMS OF CYANIDE AND OTHER INDUSTRIAL WASTES FROM MIDCO I AND MIDCO II WITHIN 90 DAYS. THIS ORDER WAS NEVER OBEYED.

IN APPROXIMATELY FEBRUARY 1979, INTEC DISCONTINUED OPERATIONS LEAVING THOUSANDS OF DRUMS OF WASTE CHEMICALS UNATTENDED ON THE SITE. ONE PROPERTY OWNER BULLDOZED DRUMS OF WASTE OFF HIS PROPERTY CAUSING RUPTURING OF SOME DRUMS.

DURING 1979, THE ISBH, US EPA AND THE GARY FIRE DEPARTMENT CONDUCTED INVESTIGATION AT THE SITE. BASED ON THE RESULTS OF THESE EFFORTS, THE UNITED STATES FILED A COMPLAINT IN THE FEDERAL DISTRICT COURT IN HAMMOND, INDIANA UNDER SECTION 7003 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (CIVIL ACTION NO. H-79-556). A PRELIMINARY INJUNCTION AND TEMPORARY RESTRAINING ORDER WERE GRANTED ON JANUARY 31, 1980, THAT DIRECTED INTEC TO REMOVE CERTAIN SURFACE WASTES FROM MIDCO I. BY FURTHER ORDER OF THE COURT ON DECEMBER 4, 1980, INTEC WAS REQUIRED TO REMOVE CERTAIN SURFACE WASTES FROM MIDCO I.

ON DECEMBER 4, 1980, THE OPERATORS OF MIDWEST SOLVENT DISPOSAL COMPANY WERE ORDERED TO SUBMIT TO US EPA A PLAN FOR REMOVAL OF ALL WASTES STORED ON THE SITE NOT ATTRIBUTABLE TO INTEC, AND TO DESIGN A PLAN TO DETERMINE THE NATURE AND EXTENT OF THE SOIL AND GROUND WATER CONTAMINATION. HOWEVER, THESE COURT ACTIONS WERE INEFFECTIVE, AND IN LATE JANUARY 1980, AN ESTIMATED 14,000 DRUMS WERE STOCKPILED UP TO FOUR DRUMS HIGH, AND THOUSANDS OF FIRE-DAMAGED DRUMS STILL REMAINED ON THE GROUND. IN JUNE 1981, THE EPA ENCLOSED THE SITE WITH A FENCE. IN JUNE 1981, SEVERE FLOODING CAUSED WATER IN THE AREA TO DRAIN WEST INTO HAMMOND. CONTACT WITH THIS FLOOD WATER REPORTEDLY CAUSED SKIN BURNS, WHICH MANY BELIEVE WERE DUE TO DRAINAGE FROM MIDCO I AND THE NINTH AVENUE DUMP, LOCATED NORTH OF MIDCO I.

THE US EPA FUNDED A HYDROGEOLOGIC STUDY PERFORMED FROM JUNE 1981 TO SEPTEMBER 1982 TO PROVIDE A PRELIMINARY INDICATION OF CONTAMINANTS PRESENT IN THE SOIL AND GROUND WATER, TO DETERMINE GROUND WATER FLOW, AND TO DEFINE THE EXTENT OF CONTAMINATION RELATED TO THE SITE.

THE US EPA ANNOUNCED ON JANUARY 27, 1982, THE ALLOCATION OF FUNDS AND A CONTRACT AWARD FOR THE REMOVAL OF HAZARDOUS WASTE FROM THE MIDCO I SITE. THIS ACTION WAS CONDUCTED FROM FEBRUARY 26 TO JULY 7, 1982. IT INCLUDED REMOVAL AND OFF-SITE DISPOSAL OF APPROXIMATELY 7,000 CUBIC YARDS OF CRUSHED DRUMS, 84,000 GALLONS OF SOLVENTS, 5,600 GALLONS OF ACIDS, 13,500 GALLONS OF BASES, 56,500 GALLONS OF INERT COMPOUNDS, 940 DRUMS OF FLAMMABLE SOLIDS, 170 LABPACKS, AND 7,200 CUBIC YARDS OF CONTAMINATED SOIL (THE TOP 1 FOOT).

IT ALSO INCLUDED PLACING A 6-12 INCH CLAY SOIL COVER OVER MOST OF THE SITE. IN ADDITION, 840 DRUMS OF WASTES WERE REMOVED FROM THE SITE BY A RESPONSIBLE PARTY, AND ONE SURFACE TANKER WAS REMOVED BY INTEC. THIS CONCLUDED THE SURFACE REMOVAL ACTION BUT THE CONTAMINATED SOIL AND GROUND WATER HAD NOT BEEN ADDRESSED.

MIDCO I WAS PLACED ON THE NATIONAL PRIORITIES LIST (NPL) IN DECEMBER 1982. THE NPL IS A LIST OF ABANDONED OR UNCONTROLLED HAZARDOUS WASTE SITES THAT ARE ELIGIBLE FOR INVESTIGATION AND REMEDIATION UNDER CERCLA.

ON JANUARY 19, 1984, THE UNITED STATES FILED ITS FIRST AMENDED COMPLAINT FOR CIVIL ACTION NO. H-79-556 ADDING CLAIMS FOR INJUNCTIVE RELIEF UNDER SECTION 106 OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA), AND RECOVERY OF RESPONSE COSTS INCURRED BY THE UNITED STATES UNDER SECTION 107 OF CERCLA AND ADDING GENERATOR DEFENDANTS.

THE US EPA COMPLETED A WORK PLAN FOR A REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) FOR THIS SITE, AND INITIATED FIELD WORK FOR THE RI/FS IN FEBRUARY 1985. THE PURPOSE OF THE RI WAS TO COLLECT DATA NEEDED TO DETERMINE THE FULL EXTENT OF HAZARDS REMAINING AT THE SITE AND TO EVALUATE ALTERNATIVES FOR REMEDIAL ACTIONS. THE RI INCLUDED GEOPHYSICAL, SOIL GAS, SOIL, HYDROGEOLOGICAL, SURFACE WATER, SURFACE SEDIMENT AND GROUND WATER INVESTIGATIONS. HOWEVER, THE US EPA AGREED TO DISCONTINUE ITS WORK ON THE RI/FS IN APRIL 1985, WHEN A GROUP OF DEFENDANTS AGREED TO CONDUCT THE RI/FS IN ACCORDANCE WITH THE US EPA-APPROVED WORK PLAN.

AN AGREEMENT WAS FORMALIZED ON JUNE 19, 1985 BY A PARTIAL CONSENT DECREE IN UNITED STATES OF AMERICA V. MIDWEST SOLVENT RECOVERY, INC. ET. AL. LODGED WITH THE UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF INDIANA. THIS PARTIAL CONSENT DECREE REQUIRED REIMBURSEMENT OF PAST COSTS AND SPECIFIED THAT AN RI/FS BE COMPLETED IN ACCORDANCE WITH THE US EPA'S WORK PLAN FOR THE MIDCO I SITE BY THE DEFENDANTS. LITIGATION WAS STAYED UNTIL COMPLETION OF THE RI/FS.

THE CONTRACTOR FOR THE DEFENDANTS STARTED WORK IN MAY 1985. AFTER REVIEW OF THE FIRST DRAFT REMEDIAL INVESTIGATION (RI) REPORT, US EPA REQUIRED ADDITIONAL SAMPLING IN FEBRUARY 1987. THIS SAMPLING WAS COMPLETED AND A FINAL RI REPORT WAS APPROVED BY US EPA IN DECEMBER 1987. THE CONTRACTOR SUBMITTED A FINAL FS REPORT IN FEBRUARY 1989.

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III. COMMUNITY RELATIONS

A PUBLIC MEETING WAS HELD ON FEBRUARY 21, 1985, TO EXPLAIN THE PROPOSED REMEDIAL INVESTIGATION/FEASIBILITY STUDY. US EPA UPDATED THE COMMUNITY ON THE STATUS OF THE RI/FS USING FACT SHEETS IN NOVEMBER 1987 AND DECEMBER 1988.

A PROPOSED PLAN WAS PREPARED EXPLAINING ALTERNATIVES EVALUATED AND THE BASIS FOR PREFERENCE FOR ONE ALTERNATIVE. THE PLAN WAS MAILED TO OVER 100 PERSONS IN THE COMMUNITY. AVAILABILITY OF THE PLAN WAS PUBLISHED IN TWO LOCAL NEWSPAPERS. A PUBLIC COMMENT PERIOD WAS HELD FROM APRIL 20 TO MAY 19, 1989. A PUBLIC MEETING WAS HELD ON APRIL 27, 1989 IN A HIGH SCHOOL NEAR THE SITE.

VERBAL PUBLIC COMMENTS WERE RECEIVED DURING THE PUBLIC MEETING. WRITTEN COMMENTS WERE RECEIVED FROM ONE RESIDENT OF GARY, FROM THE CITY OF HAMMOND, FROM THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT, AND FROM MEMBERS OF THE MIDCO STEERING COMMITTEE, WHICH REPRESENTS POTENTIALLY RESPONSIBLE PARTIES AT THE SITE. A SUMMARY OF THEIR MAJOR COMMENTS AS WELL AS US EPA'S RESPONSE TO THEM IS INCLUDED IN THE RESPONSIVENESS SUMMARY IN THE APPENDIX.

THE US EPA-SELECTED REMEDIAL ACTIONS IDENTIFIED IN THE RECORD OF DECISION DIFFER FROM THE PREFERRED ALTERNATIVE DESCRIBED IN THE PROPOSED PLAN IN THE FOLLOWING WAYS:

1. AS AN ALTERNATIVE TO DEEP WELL INJECTION, THE OPTION OF REINJECTION OF THE GROUND WATER BACK INTO THE CALUMET AQUIFER IS ALLOWED FOLLOWING TREATMENT, WITH THE CONDITION THAT THIS OPERATION NOT CAUSE SPREADING OF THE SALT PLUME.
2. A TREATABILITY VARIANCE IS APPROVED FOR THE SOLIDIFICATION STABILIZATION (S/S) OPERATION FROM THE LAND DISPOSAL RESTRICTION (LDR) TREATMENT STANDARDS. THIS IS BEING APPROVED BECAUSE EXISTING AVAILABLE DATA DO NOT DEMONSTRATE THAT S/S CAN ATTAIN LDR TREATMENT STANDARDS CONSISTENTLY FOR ALL SOIL AND DEBRIS AT THIS SITE. THE TREATABILITY VARIANCE ALLOWS ATTAINMENT OF STANDARDS THAT HAVE BEEN

DEMONSTRATED TO BE ATTAINABLE FOR SOIL AND DEBRIS.

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IV. SCOPE AND ROLE OF THE RESPONSE ACTION

REMOVAL OF SURFACE WASTES, AN UNDERGROUND TANK AND THE TOP ONE-FOOT OF CONTAMINATED SOIL WAS COMPLETED BY US EPA IN 1982. THIS RECORD OF DECISION IS FOR THE FINAL REMEDIAL ACTION AND WILL ADDRESS THE REMAINING CONTAMINATION AT THE SITE INCLUDING CONTAMINATED SUBSURFACE SOIL AND FILL MATERIALS, CONTAMINATED GROUND WATER AND CONTAMINATED SURFACE SEDIMENTS.

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V. SITE CHARACTERISTICS

THE RI SHOWED THAT ON-SITE SUBSURFACE SOILS ARE HIGHLY CONTAMINATED BY A LARGE NUMBER OF CHEMICALS AND CONTAIN SOME CRUSHED DRUMS AND OTHER DEBRIS. GROUND WATER BELOW THE SITE IS ALSO HIGHLY CONTAMINATED, BUT THE CONTAMINATED GROUND WATER DOES NOT EXTEND VERY FAR FROM THE SITE. SOME SURFACE SEDIMENTS NEAR THE SITE HAVE ALSO BEEN CONTAMINATED. THE GROUND WATER WAS ALSO HIGHLY SALINE, IT APPEARS LARGELY DUE TO RUN-OFF FROM THE ADJACENT INDIANA DEPARTMENT OF HIGHWAYS FACILITY.

SOURCE:

ON-SITE SUBSURFACE SOIL AND DEBRIS ARE A CONTINUING SOURCE OF CONTAMINANTS TO THE GROUND WATER AND SURFACE WATER. FOURTEEN TEST TRENCHES WERE EXCAVATED INTO THE MOST CONTAMINATED PORTIONS OF THE SITE AND NINETEEN SAMPLES WERE COLLECTED TO CHARACTERIZE THE EXTENT AND NATURE OF THIS SOURCE. THE EAST-CENTRAL PORTION OF THE SITE HAS THE HIGHEST CONTAMINATION. THE MINIMUM, MAXIMUM AND MEAN CONCENTRATIONS OF CHEMICALS DETECTED IN THESE SAMPLES ARE SUMMARIZED IN TABLE 1 IN THE APPENDIX. ELEVATED CONCENTRATIONS OF THE FOLLOWING CHEMICALS WERE DETECTED:

METHYLENE CHLORIDE	BARIUM
ACETONE	CADMIUM
2-BUTANONE	CHROMIUM
4-METHYL-2-PENTANONE	COPPER
TOLUENE	LEAD
ETHYLBENZENE	NICKEL
XYLENE	ZINC
PHENOL	CYANIDE
BIS(2-ETHYLHEXYL) PHTHALATE	
1,1,1-TRICHLOROMETHANE	
TRICHLOROETHENE	
TETRACHLOROETHANE	
BENZENE	
CHLOROBENZENE	
ISOPHORONE	
BUTYL BENZYL PHTHALATE	
DI-N-BUTYL PHTHALATE	

A LARGE NUMBER OF POLYAROMATIC HYDROCARBONS WERE DETECTED AT UP TO A FEW HUNDRED MG/KG. PCBS WERE DETECTED IN ONE SAMPLE AT 44 MG/KG. PESTICIDES WERE DETECTED IN TWO SAMPLES AT BELOW 10 MG/KG.

TOTAL VOLATILE ORGANIC COMPOUNDS WERE AS HIGH AS 1.1% BY WEIGHT AND CONSISTED PREDOMINANTLY OF METHYLENE CHLORIDE, 2-BUTANONE, TOLUENE, ETHYLBENZENE, XYLENE, TRICHLOROETHENE, 4-METHYL-2-PENTANONE AND CHLOROBENZENE.

TOTAL SEMIVOLATILE ORGANIC COMPOUNDS WERE AS HIGH AS 0.8% BY WEIGHT AND CONSISTED PREDOMINANTLY OF PHENOL, POLYAROMATIC HYDROCARBONS, PHTHALATE AND ALKANES. CYANIDE WAS AS HIGH AS 2,720 MG/KG; CHROMIUM AS HIGH AS 10,200 MG/KG; AND LEAD AS HIGH AS 4,980 MG/KG.

THE ESTIMATED VOLUME OF CONTAMINATED SUBSURFACE SOIL AND DEBRIS ABOVE THE WATER TABLE IS 12,400 CUBIC YARDS.

SURFACE WATER:

SURFACE WATER SAMPLES WERE COLLECTED AT ELEVEN LOCATIONS DURING TWO ROUNDS OF SAMPLING. THE MAXIMUM, MINIMUM AND AVERAGE CONCENTRATIONS ARE SUMMARIZED IN TABLE 1. THE SAMPLING LOCATIONS ALONG WITH THE RESULTS FROM TOTAL VOLATILE ORGANIC COMPOUNDS ARE SHOWN ON (FIGURE 4). GROUND WATER WAS OBSERVED RECHARGING THE WETLAND EAST OF THE SITE AT LOCATION 1. THE SAMPLE AT LOCATION 1 CONTAINED A NUMBER OF VOLATILE ORGANIC COMPOUNDS WHICH WERE PRESENT AT HIGH CONCENTRATIONS ON THE SITE.

FIGURE 5 SHOWS INORGANIC COMPOUNDS EXCEEDING THE ACUTE WATER QUALITY CRITERIA LEVELS. THE HIGHEST METALS AND CYANIDE CONCENTRATIONS WERE FOUND IN THE WETLAND EAST OF THE SITE, WHICH RECEIVES RUN-OFF AND GROUND WATER RECHARGE FROM THE SITE. HOWEVER, OTHER POTENTIAL SOURCES OF CONTAMINATION TO THIS AREA WERE ALSO DETECTED.

SURFACE SEDIMENTS:

SURFACE SEDIMENT SAMPLES WERE COLLECTED IN ELEVEN LOCATIONS DURING TWO ROUNDS OF SAMPLING. THE MAXIMUM, MINIMUM AND AVERAGE CONCENTRATIONS ARE SUMMARIZED IN TABLE 1. THE SAMPLING RESULTS INDICATE ELEVATED CONCENTRATIONS OF TOTAL VOLATILE ORGANIC COMPOUNDS, TOTAL SEMI-VOLATILE ORGANIC COMPOUNDS, PCBS, CHLORDANE, CADMIUM, CHROMIUM, AND LEAD IN THE DEPRESSIONS DIRECTLY NORTH AND EAST OF THE SITE. HOWEVER, IT WAS DETERMINED THAT OTHER SOURCES OF CONTAMINATION WERE ALSO PRESENT. FIGURES 6 AND 7 SHOW THE DISTRIBUTION OF TOTAL VOLATILE ORGANIC COMPOUNDS, AND PESTICIDE/PCBS IN SEDIMENT SAMPLES.

GROUND WATER:

THIRTY-THREE MONITORING WELLS WERE INSTALLED AND SAMPLED DURING TWO ROUNDS. A LIMITED NUMBER OF WELLS WERE SAMPLED FOR CYANIDE AND A FEW OTHER PARAMETERS DURING A THIRD ROUND. THE MAXIMUM, MINIMUM AND AVERAGE CONCENTRATIONS ARE SUMMARIZED IN TABLE 1.

AN UNANTICIPATED RESULT WAS THE FINDING THAT THE AQUIFER IN THE VICINITY OF MIDCO I IS HIGHLY CONTAMINATED WITH SALT CONSISTING PRIMARILY OF SODIUM AND CHLORIDE. CHLORIDE WAS AS HIGH AS 15,000 MG/L BELOW THE SITE. THE EXTENT OF THIS CONTAMINATION IS INDICATED BY THE CHLORIDE ISOLINES FOR THE 10-FEET DEEP WELLS IN FIGURE 8 AND THE 30-FEET DEEP WELLS IN FIGURE 9.

THE MIDCO I RI RESULTS, AS WELL AS A STUDY FOR THE NINTH AVENUE DUMP RI, INDICATED THAT A VERY HIGH CONCENTRATION SALINITY PLUME IS MIGRATING FROM THE ADJACENT INDIANA DEPARTMENT OF HIGHWAYS (IDOH) SALT STORAGE FACILITY. A STUDY OF AERIAL PHOTOGRAPHS FOR THE MIDCO I RI DETERMINED THAT (AT LEAST FROM 1970-1975) AN UNPROTECTED STOCK PILE WAS PRESENT AT THE IDOH FACILITY NEAR A SWALE ON THE NORTHERN HALF OF WHAT IS NOW THE MIDCO I SITE. PRESUMABLY THIS STOCK PILE WAS SALT AND THE HIGHLY SALINE DRAINAGE FROM THE PILE DRAINED INTO THE SWALE ON MIDCO I CONTRIBUTING TO A SALT PLUME FROM THAT FACILITY. DRAINAGE FROM MIDCO I AND EVEN BULK DISCHARGE OF SALINE WASTE MATERIALS INTO THE SWALE DURING MIDCO I OPERATIONS COULD ALSO HAVE CONTRIBUTED TO THE SALINITY PLUME AT AND DOWNGRAIDENT FROM MIDCO I.

SOME OF THE GROUND WATER SAMPLING RESULTS FOR HAZARDOUS SUBSTANCES ARE SUMMARIZED IN FIGURES 10, 11, AND 12. HAZARDOUS SUBSTANCES DETECTED AT HIGH CONCENTRATIONS IN ON-SITE GROUND WATER COMPARED TO BACKGROUND INCLUDE: CHROMIUM; NICKEL; ZINC; CYANIDE; METHYLENE CHLORIDE; TRANS-1,2-DICHLOROETHENE; CHLOROFORM; 1,1,1-TRICHLOROETHANE; VINYL CHLORIDE; CHLOROETHANE; ACETONE; 2-BUTANONE; 4-METHYL-2-PENTONE; BENZENE; TOLUENE; TOTAL XYLENE; PHENOL; BENZOIC ACID; ISOPHORONE; TRANS-1,2-DICHLOROETHENE AND 1-1 DICHLOROETHANE. THE TOTAL VOLATILE ORGANIC COMPOUND (VOC) CONTENT OF THE GROUND WATER SAMPLES WAS AS HIGH AS 476,000 UG/L (MW5), BUT THE VOCS DECREASED TO LESS THAN 100 UG/L IMMEDIATELY NORTH OF THE SITE IN THE 10 FOOT DEEP MONITORING WELLS.

ELEVATED CONCENTRATIONS OF METHYLENE CHLORIDE, ACETONE, 2-BUTANONE, BENZOIC ACID, PHENOL, CYANIDE AND LEAD WERE DETECTED IN OFF-SITE WELLS A30 AND/OR B30. SINCE THERE IS LITTLE OR NO VERTICAL GRADIENT IN THE SHALLOW AQUIFER IN THIS AREA, IT IS BELIEVED THAT THESE HAZARDOUS SUBSTANCES WERE CARRIED TO THE BOTTOM OF THE AQUIFER WITH HIGHLY SALINE (AND DENSE) WATER. THE HAZARDOUS SUBSTANCES WERE LIKELY FROM THE MIDCO I OPERATIONS.

BIOTA:

THE US FISH AND WILDLIFE SERVICE COLLECTED SAMPLES OF FISH, CRAYFISH, SNAPPING TURTLES, SMALL MAMMALS AND EARTHWORMS NEAR MIDCO I. THESE SAMPLES WERE ANALYZED FOR ORGANIC AND INORGANIC HAZARDOUS SUBSTANCES. THE RESULTS WERE COMPARED TO THE RESULTS IN CONTROL SAMPLES. ALTHOUGH THE US FISH AND WILDLIFE SERVICE HAS NOT YET ISSUED ITS FINAL REPORT, PRELIMINARY RESULTS INDICATE THAT THE FOLLOWING HAZARDOUS SUBSTANCES WERE FREQUENTLY DETECTED AT ELEVATED CONCENTRATIONS RELATIVE TO THE CONTROL SAMPLES:

2-BUTANONE	ALUMINUM
TOLUENE	COPPER
ETHYLBENZENE	LEAD
XYLENE	SILVER

WITH THE EXCEPTION OF ALUMINUM AND SILVER, THESE HAZARDOUS SUBSTANCES WERE ALSO ELEVATED IN THE SOURCE, GROUND WATER OR SURFACE WATER AND SEDIMENTS AT MIDCO I (COMPARED TO CONTROLS).

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VI. SUMMARY OF SITE RISKS

FOR A FUTURE DEVELOPMENT SCENARIO INCLUDING USAGE OF THE GROUND WATER, SOIL INGESTION AND AIR EXPOSURE, AN ESTIMATE OF THE HEALTH RISKS IS AS FOLLOWS:

	LIFETIME CUMULATIVE CARCINOGENIC RISK*	CUMULATIVE NON-CARCINOGENIC RISK INDEX*
EXPOSURE TO GROUND WATER	4.1 X 10 ⁻²	86
EXPOSURE TO SOILS	6.8 X 10 ⁻⁵	3.6
EXPOSURE TO FUTURE SURFACE WATER	2.2 X 10 ⁻⁶	0.0039

* RISKS FROM EXPOSURE TO GROUND WATER AND SOILS ARE FROM TABLE 4-22 OF THE ADDENDUM TO PUBLIC COMMENT FEASIBILITY STUDY, MIDCO I, MARCH 7, 1989 (EXCLUDING ARSENIC WHICH IS AT BACKGROUND). RISK FROM EXPOSURE TO SURFACE WATER IS FROM APPENDIX A OF THE PUBLIC COMMENT FEASIBILITY STUDY, FEBRUARY 10, 1985.

THE MAIN COMPOUNDS CAUSING THE CARCINOGENIC RISKS ARE:

GROUND WATER - METHYLENE CHLORIDE, VINYL CHLORIDE, BENZENE;

SOILS - PCBS, BIS (2-ETHYLHEXYL) PHTHALATE, TETRACHLOROETHANE, METHYLENE CHLORIDE, DIELDRIN TRICHLOROETHENE; AND BENZO(A)PYRENE;

SURFACE WATER - VINYL CHLORIDE, AND METHYLENE CHLORIDE.

THE MAIN COMPOUNDS CAUSING THE NON-CARCINOGENIC RISKS IN GROUND WATER ARE: METHYLENE CHLORIDE, 4-METHYL-2-PENTANONE, 2-BUTANONE, PHENOL, NICKEL, CHROMIUM (AS CR(VI)), CHLOROFORM, AND ACETONE.

THE FOLLOWING HAZARDOUS SUBSTANCES WERE DETECTED AT CONCENTRATIONS ABOVE THE PRIMARY DRINKING WATER REGULATION MAXIMUM CONTAMINANT LEVELS (MCLS) (40 CFR 41) IN GROUND WATER NEAR THE SITE: TRANS-1,2-DICHLOROETHANE; TRICHLOROETHENE; 1,2-DICHLOROETHANE; BENZENE; TOLUENE; ETHYLBENZENE; VINYL CHLORIDE; HALOGENATED METHANES; SELENIUM; CADMIUM; BARIUM; AND CHROMIUM.

A CUMULATIVE SUBCHRONIC HAZARD INDEX FOR AN ON-SITE FUTURE DEVELOPMENT SCENARIO WAS CALCULATED TO BE 63. THIS WAS CALCULATED BY ADDING THE RATIOS OF THE ESTIMATED SUBCHRONIC EXPOSURE RATE (SER) TO THE ACCEPTABLE SUBCHRONIC INTAKE (ASI) FOR EACH CHEMICAL. THE INDEX EXCEEDED UNITY (OR ONE) FOR ALL AGE GROUPS FOR NICKEL, TOLUENE AND 2-BUTANONE. IF THE INDEX IS LESS THAN ONE, NO ADVERSE HEALTH EFFECTS WOULD BE EXPECTED. IN ADDITION, THE INDEX EXCEEDED UNITY FOR PICA CHILDREN FOR LEAD, CYANIDE (ASSUMED HCN), AND BIS(2-ETHYLHEXYL) PHTHALATE (REMEDIAL INVESTIGATION OF MIDWEST SOLVENT RECOVERY (MIDCO I). DECEMBER 1987, PP 6-58, 6-59 AND TABLE 6-20).

FOR THE NEAREST OFF-SITE RESIDENTS, THE LIFETIME CUMULATIVE CANCER RISK WAS ESTIMATED TO BE 5.7 X 10⁻⁵, MAINLY DUE TO BENZENE EMISSIONS TO AIR AND INGESTION OF ARSENIC AND BENZO(A)PYRENE IN SOILS NORTH OF THE SITE. HOWEVER, THE CONCENTRATION OF ARSENIC IN THESE SOILS WAS BELOW THE AVERAGE DETECTED IN BACKGROUND SAMPLES (REMEDIAL INVESTIGATION OF MIDWEST SOLVENT RECOVERY (MIDCO I), DECEMBER 1987, P-6-61 AND TABLE 6-22).

IF NO ACTION IS TAKEN TO CONTAIN OR RECOVER THE GROUND WATER, CONTAMINANTS WILL CONTINUE TO MIGRATE FROM THE SITE IN THE GROUND WATER. THE CONTAMINATED GROUND WATER IS PREDICTED TO AFFECT THE AREA SHOWN IN FIGURE 13, AND COULD AFFECT UP TO 19 RESIDENTIAL WELLS (SOME OF WHICH ARE USED FOR DRINKING) IN THE CALUMET AQUIFER. IT WILL ALSO AFFECT THE SURROUNDING WETLANDS.

ALTERNATIVELY, THE CONTAMINATED GROUND WATER COULD DISCHARGE TO THE SEWER NORTH-NORTHEAST OF THE SITE (IF IT IS LEAKING), FLOW THROUGH THE CITY OF GARY WASTEWATER TREATMENT PLANT, DISCHARGE TO THE GRAND CALUMET RIVER AND EVENTUALLY REACH LAKE MICHIGAN.

IT HAS BEEN ARGUED THAT THE CALUMET AQUIFER AT MIDCO I SHOULD BE CONSIDERED A CLASS III AQUIFER BECAUSE OF THE HIGH SALINITY, AND, THEREFORE, THAT THE AQUIFER SHOULD NOT BE PROTECTED FOR DRINKING WATER USAGE. HOWEVER, BECAUSE THE SALINITY IS NOT NATURAL AND HAS ONLY AFFECTED A LIMITED PORTION OF THE AQUIFER AND BECAUSE THE GROUND WATER IN THE BULK OF THE AQUIFER IS OF DRINKING WATER QUALITY AND INDEED IS USED AS A DRINKING WATER SOURCE A SHORT DISTANCE FROM THE SITE, US EPA HAS DETERMINED THAT THE CALUMET AQUIFER IN THE VICINITY OF MIDCO I IS A CLASS II AQUIFER AND SHOULD BE PROTECTED FOR DRINKING WATER USAGE.

IT HAS ALSO BEEN ARGUED THAT THERE SHOULD BE CONSIDERED NO RISK DUE TO FUTURE DRINKING WATER USAGE OF THE GROUND WATER BECAUSE THE HIGH SALINITY WOULD PREVENT ITS USAGE. HOWEVER, THERE IS NO ASSURANCE THAT THE CONTAMINANTS FROM THE SITE WILL ALWAYS MIGRATE WITHIN THE SALINITY PLUME. IN FACT, FIGURES 8 AND 9 SHOW THAT ONLY A SMALL PORTION OF THE GROUND WATER BELOW THE SITE HAS A TOTAL DISSOLVED SOLIDS CONTENT GREATER THAN 10,000 MG/L, WHICH IS THE CONCENTRATION USED IN THE US EPA UNDERGROUND INJECTION CONTROL PROGRAM AS THE CUT-OFF POINT FOR DRINKING WATER USAGE. IN ADDITION, THE MIDCO I OPERATION CONTRIBUTED AN UNDETERMINABLE AMOUNT OF THE GROUND WATER SALINITY PROBLEM AT AND DOWNGRADIENT FROM THE SITE.

THE FOLLOWING PARAMETERS EXCEEDED THE CHRONIC AND, FOR SOME, ALSO THE ACUTE WATER QUALITY CRITERIA FOR PROTECTION OF AQUATIC LIFE IN SOME SURFACE WATER SAMPLES: DIETHYLPHTHALATE, DI-N-BUTYLPHTHALATE, CADMIUM, CHROMIUM COPPER, IRON, LEAD, MERCURY, NICKEL, SILVER, ZINC AND CYANIDE. THE US FISH AND WILDLIFE SERVICE BELIEVES THAT THE BIOTA LIVING IN THE VICINITY OF MIDCO I ACCUMULATED ELEVATED CONCENTRATIONS OF VOLATILE AND INORGANIC COMPOUNDS, WHICH ADVERSELY AFFECTED FISH AND WILDLIFE RESOURCES.

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VIII. DESCRIPTION OF ALTERNATIVES

A LARGE NUMBER OF ALTERNATIVES WERE SCREENED, USING ENGINEERING JUDGEMENT FOR APPLICABILITY, PAST PERFORMANCE AND IMPLEMENTABILITY. DETAILED EVALUATIONS WERE CONDUCTED FOR 14 ALTERNATIVES, WHICH ARE COMBINATIONS OF THE MOST PROMISING TECHNOLOGIES. THESE TECHNOLOGIES CAN BE CATEGORIZED AS FOLLOWS:

CONTAINMENT:

- * MULTILAYERED CAP
- * SLURRY WALL

GROUND WATER TREATMENT:

- * PUMPING OF CONTAMINATED GROUND WATER AND DISPOSAL IN AN UNDERGROUND INJECTION WELL WITHOUT TREATMENT
- * PUMPING OF CONTAMINATED GROUND WATER, TREATMENT AND THEN DISPOSAL IN AN UNDERGROUND INJECTION WELL
- * PUMPING OF CONTAMINATED GROUND WATER AND TREATMENT BY EVAPORATION

SOURCE TREATMENT:

- * SOIL VAPOR EXTRACTION
- * SOLIDIFICATION/STABILIZATION
- * IN-SITU VITRIFICATION
- * INCINERATION

ALTERNATIVES PROVIDING FOR DIRECT TREATMENT OR REMOVAL OF CONTAMINATED SOILS BELOW THE WATER TABLE WERE ELIMINATED FOR A NUMBER OF REASONS. FOR ONE, TREATMENT OF SOILS BELOW THE WATER TABLE WOULD NORMALLY REQUIRE DEWATERING OF THE AQUIFER BELOW THE SITE PRIOR TO EXCAVATION. DEWATERING WOULD REQUIRE INSTALLATION OF A CONTAINMENT BARRIER AND DISPOSAL OF A LARGE VOLUME OF CONTAMINATED GROUND WATER. BECAUSE OF THE TIME NEEDED FOR THE INJECTION WELL CONSTRUCTION, THE CONTAMINATED GROUND WATER FOR DEWATERING WOULD HAVE TO BE COMMERCIALY DISPOSED OF. THE NEAREST COMMERCIAL DEEP WELL IS IN OHIO, SO THIS DISPOSAL WOULD BE EXPENSIVE AND ADD TRANSPORTATION HAZARDS. IN ADDITION, GROUND WATER PUMP AND TREATMENT ALTERNATIVES MAY ADDRESS READILY LEACHABLE CONTAMINANTS BY GRADUAL REMOVAL BY NATURAL GROUND WATER FLUSHING. CONTAMINANTS THAT DO NOT LEACH OUT WOULD NORMALLY NOT BE AVAILABLE FOR DIRECT INGESTION BECAUSE THEY ARE BELOW THE WATER TABLE. THEREFORE, THE SOURCE REMOVAL AND TREATMENT ALTERNATIVES ONLY ADDRESS CONTAMINATED SUBSURFACE SOILS AND MATERIALS ABOVE THE WATER TABLE, AND HIGHLY CONTAMINATED MATERIALS BELOW THE WATER TABLE THAT CAN BE HANDLED BY LOCALIZED DEWATERING.

THE AREAL EXTENT AND DEPTH OF SOURCE TREATMENT ABOVE THE WATER TABLE WILL BE DETERMINED BY SOIL CLEANUP ACTION LEVELS (CALs). THE EXTENT AND PERIOD OF OPERATION OF GROUND WATER TREATMENT MEASURES WILL BE DETERMINED BY GROUND WATER CALs. SURFACE SEDIMENTS WILL BE SCRAPPED UP IN THE AREAS SHOWN IN FIGURE 14 TO A DEPTH THAT WILL LEAVE THE REMAINING SEDIMENTS BELOW THE SOILS CALs. THE CALs ARE DEFINED IN SECTION X, AND INCLUDES ATTAINMENT OF MCLs IN THE GROUND WATER. THE EXPECTED AREAL EXTENT OF SOURCE AND SURFACE SEDIMENT REMEDIATION REQUIRED IS SHOWN IN FIGURE 14. THE EXPECTED AREAL EXTENT OF GROUND WATER REMEDIATION IS SHOWN IN FIGURE 15. APPLICABLE, OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) FOR THE VARIOUS ALTERNATIVES ARE SUMMARIZED IN TABLES 6, 7 AND 8 IN THE APPENDIX. THE FOURTEEN ALTERNATIVES ARE SUMMARIZED BELOW, INCLUDING THE STATUS OF COMPLIANCE WITH MAJOR ARARS:

ALTERNATIVE 1: NO ACTION

BY LAW, US EPA IS REQUIRED TO CONSIDER THE NO-ACTION ALTERNATIVE. NO ACTION WOULD BE TAKEN TO ADDRESS THE SOURCE, THE CONTAMINATED GROUND WATER OR SURFACE WATER. THE SOURCE WOULD CONTINUE TO CAUSE CONTAMINATION OF THE GROUND WATER AND SURFACE WATERS. THE CONTAMINATED GROUND WATER WOULD CONTINUE MIGRATING OFF-SITE AND MAY EVENTUALLY AFFECT NINETEEN GROUND WATER WELLS.

ALTERNATIVE 2: ACCESS RESTRICTIONS WITH CAP

THIS ALTERNATIVE CONSISTS OF THE CONSTRUCTION OF A RCRA COMPLIANT MULTI-LAYER CAP OVER THE ENTIRE SITE, AN AREA OF APPROXIMATELY 150,000 SQUARE FEET. THE CAP WOULD INCLUDE A LOW-PERMEABILITY BARRIER LAYER TO PREVENT VERTICAL MIGRATION OF WATER, A LATERAL DRAINAGE LAYER AND A VEGETATIVE COVER, AS SHOWN IN FIGURE 16.

THE SCRAPPED CONTAMINATED SEDIMENTS (ESTIMATED TO BE 1,200 CUBIC YARDS) WOULD BE EXCAVATED AND TRANSPORTED TO AN OFF-SITE LANDFILL FOR DISPOSAL.

GROUND WATER USE RESTRICTIONS WOULD BE PLACED IN THE AREA SHOWN IN FIGURE 13. THE NINETEEN CURRENT USERS OF THE GROUND WATER IN THE CALUMET AQUIFER IN THAT AREA (BOTH DOMESTIC DRINKING AND NON-DRINKING) WOULD BE CONNECTED TO THE MUNICIPAL WATER SYSTEM.

THIS AND ALL THE REMAINING ALTERNATIVES WOULD INCLUDE INSTALLATION OF A SIX FOOT CHAIN LINK FENCE WITH 3-STRAND BARBED WIRE AROUND THE SITE, INSTALLING WARNING SIGNS, AND IMPOSITION OF DEED RESTRICTIONS.

GROUND WATER AND SURFACE WATER MIGRATION WOULD BE MONITORED REGULARLY.

1. RELEVANT AND APPROPRIATE REQUIREMENTS:

THIS ALTERNATIVE WOULD BE CONSISTENT WITH HAZARDOUS WASTE LANDFILL CLOSURE REQUIREMENTS OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) (40 CFR 264.111, 264.116, 264.117, 264.310), AND GROUND WATER MONITORING REQUIREMENTS OF RCRA (40 CFR 264.97, AND 264.99). HOWEVER, IT WOULD NOT BE CONSISTENT WITH THE PRIMARY DRINKING WATER REGULATIONS (40 CFR 141) OR THE RCRA CORRECTIVE ACTION REQUIREMENTS (40 CFR 264.100) BECAUSE CONTAMINATION FROM THE SITE WOULD CONTINUE TO CAUSE EXCEEDANCE OF THE MCLs IN OFF-SITE GROUND WATER. IT ALSO WOULD NOT BE CONSISTENT WITH THE AMBIENT WATER QUALITY CRITERIA (AWQC) FOR PROTECTION OF AQUATIC LIFE, BECAUSE THE CONTAMINATED GROUND WATER WOULD RECHARGE SURFACE WATERS AND CAUSE EXCEEDANCE OF THE AWQC.

2. APPLICABLE REQUIREMENTS:

THE OFF-SITE DISPOSAL OF CONTAMINATED SEDIMENTS WOULD HAVE TO BE IN COMPLIANCE WITH US EPA'S OFF-SITE POLICY AND ALL APPLICABLE RCRA, AND DEPARTMENT OF TRANSPORTATION (DOT) REGULATIONS.

ALTERNATIVE 3: CONTAINMENT

A CLAY SLURRY WALL WOULD BE INSTALLED AROUND THE AREA WHERE CLEAN-UP ACTION LEVELS (CALs) ARE EXCEEDED IN SOILS ABOVE THE WATER TABLE AND FOR GROUND WATER. THE WALL WOULD BE KEYED INTO THE MATERIAL CONFINING LAYER LOCATED 30 FEET BELOW THE SITE, AND WOULD BE APPROXIMATELY 36 INCHES WIDE AND 2,050 FEET LONG.

BECAUSE OF THE HIGH SALT CONTENT AND OTHER CONTAMINANTS AT THE SITE, BENCH SCALE TESTS WOULD BE PERFORMED IN ORDER TO DETERMINE THE FORMULATION FOR THE SLURRY. BENTONITE CLAY MAY BE AFFECTED BY THE HIGH SALINITY, SO ATTAPULGITE CLAY MAY BE USED INSTEAD.

A MULTI-LAYER CAP AS DESCRIBED IN ALTERNATIVE 2 WOULD BE PLACED OVER THE AREA INSIDE THE SLURRY WALL. CONTAMINATED SURFACE SEDIMENTS WOULD BE SCRAPED AND CONTAINED WITHIN THE CAP AND SLURRY WALL. AN EXTRACTION WELL WOULD BE PLACED IN THE CONTAINMENT AREA TO LOWER THE GROUND WATER INSIDE THE WALL BY APPROXIMATELY 0.5 FEET TO INSURE AN INWARD GROUND WATER GRADIENT. INITIALLY, THIS WOULD REQUIRE DISPOSAL OF APPROXIMATELY 21,500 GALLONS OF CONTAMINATED GROUND WATER. THIS WOULD BE DISPOSED OF IN THE NEAREST COMMERCIAL DEEP WELL.

AS WITH ALTERNATIVE 2, THE SITE WOULD BE FENCED AND POSTED, DEED RESTRICTION IMPOSED, AND A MONITORING PROGRAM IMPLEMENTED.

1. RELEVANT AND APPROPRIATE REQUIREMENTS:

THIS ALTERNATIVE WOULD BE CONSISTENT WITH RCRA HAZARDOUS WASTE LANDFILL CLOSURE REQUIREMENTS. BECAUSE THE GROUND WATER OUTSIDE THE SLURRY WALL WOULD MEET THE CALs, THIS ALTERNATIVE WOULD BE CONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS, AND THE PRIMARY DRINKING WATER REGULATIONS. AFTER CONTAINMENT OF THE MIDCO I SOURCE, SURFACE WATER WOULD SHORTLY MEET THE AWQC (UNLESS OTHER SOURCES ARE PRESENT).

2. RESIDUAL RISKS:

BECAUSE NO TREATMENT IS INVOLVED IN THIS ALTERNATIVE, THE RESIDUALS CONTAINED WITHIN THE SLURRY WALL AND CAP WOULD BE THE SAME AS PRESENTLY AT THE SITE. THE RISKS INVOLVED IN CASE THE CAP AND SLURRY WALL ARE DAMAGED OR IF RESIDENTIAL DEVELOPMENT OCCURRED ON THE SITE, WOULD BE THE SAME AS THE PRESENT SITE RISKS.

ALTERNATIVE 4A: GROUND WATER PUMPING AND DEEP WELL INJECTION

THIS AND ALL OTHER ALTERNATIVES TREATING THE GROUND WATER INCLUDES INSTALLATION AND OPERATION OF GROUND WATER EXTRACTION WELLS TO INTERCEPT THE CONTAMINATED GROUND WATER THAT EXCEEDS THE CALs. THE RESULTS OF A PRELIMINARY MODEL ESTIMATED THAT SEVEN EXTRACTION WELLS SHOULD BE INSTALLED TO RECOVER GROUND WATER AS SHOWN IN FIGURE 17. THE TOTAL ESTIMATED PUMPING RATE FOR THE SEVEN WELLS IS 13 GPM. THE EXTRACTION WELLS WOULD BE OPERATED UNTIL GROUND WATER CALs ARE MET IN ALL PORTIONS OF THE CALUMET AQUIFER AFFECTED BY THE SITE. BECAUSE THE CONTAMINATED GROUND WATER WOULD BE CONTAINED, AWQC WOULD SHORTLY BE ATTAINED IN SURFACE WATER, UNLESS PREVENTED BY OTHER SOURCES.

A CLASS I HAZARDOUS WASTE UNDERGROUND INJECTION WELL WOULD BE INSTALLED. THE INJECTION ZONE WOULD BE LOCATED APPROXIMATELY 2,250 FEET BELOW THE SURFACE IN THE MOUNT SIMON AQUIFER. THE UNDERGROUND INJECTION OPERATION MAY BE COMBINED WITH THE MIDCO II REMEDIAL ACTION IF THIS IS DETERMINED TO BE COST EFFECTIVE. THE 9TH AVENUE DUMP REMEDIAL ACTION MAY ALSO INCLUDE UTILIZING THE DEEP WELL FROM MIDCO FOR DISPOSAL OF SALINE WASTE WATER.

IN THESE CASES, THE COMBINED TREATMENT AND DISPOSAL ACTIVITIES WILL CONSTITUTE AN ON-SITE ACTION FOR PURPOSES OF THE OFF-SITE POLICY, WITH THE EXCEPTION THAT THE TRANSPORTED WASTES MUST BE MANIFESTED.

THE COMBINED TREATMENT AND DISPOSAL CAN BE CONSIDERED AN ON-SITE ACTION PURSUANT TO SECTION 104(D)(4) OF CERCLA BECAUSE THE FOLLOWING CRITERIA ARE MET (INTERIM RCRA/CERCLA GUIDANCE ON NON-CONTIGUOUS SITES AND ON-SITE MANAGEMENT OF WASTE AND TREATMENT RESIDUE. PORTER. MARCH 27, 1986. OSWER DIRECTIVE 9347.0-01):

1. THE SITES ARE CLOSE TOGETHER:
2. THE WASTES ARE COMPATIBLE:
3. THE WASTES WILL BE MANAGED AS PART OF A HIGHLY RELIABLE LONG-TERM REMEDY;
4. THE INCREMENTAL SHORT-TERM IMPACTS TO PUBLIC HEALTH AND THE ENVIRONMENT WILL BE MINIMAL.

1. APPLICABLE REQUIREMENTS:

THE DEEP WELL INJECTION MUST BE IN COMPLIANCE WITH THE LAND DISPOSAL RESTRICTION (LDR) REQUIREMENTS OF 40 CFR 268 AND 40 CFR 148. THE FOLLOWING LISTED HAZARDOUS WASTES HAVE BEEN DISPOSED OF ON THE SITE AND ARE CONTAINED IN THE CONTAMINATED SUBSURFACE SOILS, GROUND WATER AND SURFACE SEDIMENTS: F001, F002, F003, F005, F007, F008, F009.

FOR THIS REASON, BEFORE THE GROUND WATER CAN BE INJECTED WITHOUT TREATMENT, A PETITION TO ALLOW LAND DISPOSAL OF WASTE PROHIBITED UNDER SUBTITLE C OF 40 CFR 268, MUST BE GRANTED BY THE US EPA ADMINISTRATOR PURSUANT TO 40 CFR 268.6 AND 40 CFR 148 SUBPART C. THIS PETITION MUST DEMONSTRATE THAT THERE WILL BE NO MIGRATION OF HAZARDOUS CONSTITUENTS FROM THE INJECTION ZONE FOR AS LONG AS THE WASTES REMAIN HAZARDOUS.

A CROSS SECTION OF THE GEOLOGY OF THIS AREA IS SHOWN IN FIGURE 18. THE INJECTION ZONE IN THE MOUNT SIMON AQUIFER IS SEPARATED BY GEOLOGICAL FORMATIONS FROM DRINKING WATER AQUIFERS. NEARBY CLASS I UNDERGROUND INJECTION WELLS THAT ARE PRESENTLY OPERATING, HAVE SUBMITTED PETITIONS PURSUANT TO 40 CFR 268.6. THESE PETITIONS ARE PRESENTLY UNDER REVIEW BY US EPA.

THE INJECTION WELL MUST BE CONSTRUCTED, INSTALLED, TESTED, MONITORED, OPERATED, CLOSED AND ABANDONED IN ACCORDANCE WITH US EPA REQUIREMENTS AND CONDITIONS PURSUANT TO 40 CFR 144, AND 146. IN ADDITION, REPORTING REQUIREMENTS MUST BE IN ACCORDANCE WITH 40 CFR 144 AND 146. CONTAMINATED SURFACE SEDIMENTS WILL BE SCRAPED AND DISPOSED OF OFF-SITE IN ACCORDANCE WITH THE US EPA OFF-SITE POLICY AND APPLICABLE RCRA AND DOT REQUIREMENTS.

THE REMEDIAL ACTION MAY ALSO REQUIRE RESPONSES TO OPERATIONAL PROBLEMS, AND IMPLEMENTING CORRECTIVE ACTIONS PURSUANT TO 40 CFR 146.64, 144.67, 144.12, 144.51(D) AND 144.55. THIS COULD INCLUDE REQUIREMENTS FOR CONSTRUCTION, MONITORING, REPORTING, WELL PLUGGING, AND INJECTION WELL CLOSURE AS NECESSARY TO PREVENT MOVEMENT OF ANY CONTAMINANT INTO AN UNDERGROUND SOURCE OF DRINKING WATER (USDW) (40 CFR 144.3), DUE TO OPERATION OF THE INJECTION WELL. THIS MAY ALSO REQUIRE IMPLEMENTATION OF REMEDIAL ACTIONS TO RESTORE ANY USDW, THAT BECOMES CONTAMINATED AS A RESULT OF THE OPERATION OF THE UNDERGROUND INJECTION WELL, TO BACKGROUND WATER QUALITY TO THE EXTENT PRACTICAL, PURSUANT TO SECTION 3004(U) AND 3008(H) OF THE 1984 HAZARDOUS AND SOLID WASTE AMENDMENTS.

2. RESIDUAL RISKS AND RELEVANT AND APPROPRIATE REQUIREMENTS:

NATURAL ATTENUATION AND FLUSHING OF THE SOURCE WOULD OCCUR DURING OPERATION OF THE GROUND WATER EXTRACTION SYSTEM. HOWEVER, SOME HAZARDOUS SUBSTANCE RESIDUALS WOULD REMAIN IN THE SUBSURFACE SOILS. THE RESIDUAL RISKS CANNOT BE DETERMINED AT THIS TIME. THEREFORE, A SITE COVER WOULD BE PLACED OVER THE CONTAMINATED SOILS THAT WOULD BE CONSISTENT WITH RCRA HAZARDOUS WASTE LANDFILL CLOSURE REQUIREMENTS (40 CFR 264.111, 264.116, 264.117, 264.310). THE SITE WOULD BE FENCED, DEED RESTRICTIONS IMPOSED, AND A GROUND WATER MONITORING SYSTEM IMPLEMENTED CONSISTENT WITH RCRA REQUIREMENTS.

ALTERNATIVE 4C: GROUND WATER PUMPING, TREATMENT AND EITHER DEEP WELL INJECTION OR REINJECTION INTO THE CALUMET AQUIFER

THIS ALTERNATIVE COULD BE THE SAME AS ALTERNATIVE 4A EXCEPT THAT THE CONTAMINATED GROUND WATER WOULD BE TREATED TO THE EXTENT NECESSARY TO MEET US EPA REQUIREMENTS PRIOR TO THE DEEP WELL INJECTION. FOR THIS ALTERNATIVE, US EPA APPROVAL OF THE UNDERGROUND INJECTION WELL WOULD BE REQUIRED, BUT NO PETITION DEMONSTRATION WOULD BE NEEDED.

PRIOR TO THE DEEP WELL INJECTION, LAND DISPOSAL RESTRICTION (LDR) TREATMENT STANDARDS WOULD BE MET, FOR LISTED WASTES F001, F002, F003, AND F005 (40 CFR 268), THIS WOULD LIKELY REQUIRE AN AIR STRIPPER AND A LIQUID-PHASE GRANULAR ACTIVATED CARBON POLISH SYSTEM. TREATMENT MAY ALSO BE REQUIRED FOR CYANIDE, CHROMIUM, LEAD AND NICKEL TO MEET THE PROPOSED TREATMENT STANDARDS FOR LISTED WASTES F007, F008 AND F009 (FR, VOL 54, NO 7.) THE LDR TREATMENT STANDARDS ARE LISTED IN TABLES 19 AND 20 (THE STANDARDS FOR NON-WASTE WATERS WOULD BE APPLICABLE TO THE CONTAMINATED GROUND WATER).

IT IS ANTICIPATED THAT THE TREATMENT UNITS WOULD BE DESIGNED FOR AN AVERAGE FLOW OF 13 GPM. AIR EMISSIONS FROM THE AIR STRIPPER WOULD BE CONTROLLED MOST LIKELY WITH A CARBON CANISTER. THE DEGREE OF AIR EMISSIONS CONTROL REQUIRED IS DEFINED IN SECTION X. TREATMENT RESIDUALS, WHICH MAY INCLUDE SPENT CARBON AND METALS SLUDGE WOULD BE DISPOSED OF OFF-SITE IN ACCORDANCE WITH US EPA'S OFF-SITE POLICY AND APPLICABLE RCRA AND DOT REGULATIONS.

AS WITH ALTERNATIVE 4A, THE TREATMENT AND UNDERGROUND INJECTION WELL SYSTEM MAY BE COMBINED WITH MIDCO II.

ALTERNATIVELY, THE GROUND WATER COULD BE TREATED AND THEN REINJECTED INTO THE CALUMET AQUIFER IF REINJECTION IS CONDUCTED IN A MANNER THAT WILL PREVENT SPREADING OF THE SALT PLUME. AT THE END OF THE PUMPING, TREATMENT AND REINJECTION OPERATION, THE GROUND WATER AT THE SITE MUST MEET THE GROUND WATER CALS (SECTION X). THE GOAL OF REMEDIAL ACTIONS IS TO RESTORE THE GROUND WATER QUALITY. NORMALLY, THIS WOULD REQUIRE THAT THE REMEDIAL ACTION ALSO REDUCE SECONDARY (NON-HAZARDOUS) CONTAMINANTS SUCH AS TOTAL DISSOLVED SOLIDS (TDS) EITHER TO BACKGROUND LEVELS OR TO SECONDARY MAXIMUM CONTAMINANT LEVELS (40 CFR 143). HOWEVER, AT MIDCO I, SINCE THERE ARE ADJACENT CONTAMINANT SOURCES, HIGH LEVELS OF TDS WOULD BE LEFT IN THE GROUND WATER AT THE SITE AT COMPLETION OF THE REMEDIAL ACTION.

ALTERNATIVE 4E: GROUND WATER PUMPING AND EVAPORATION

A GROUND WATER EXTRACTION SYSTEM WOULD BE INSTALLED AND OPERATED IN THE SAME MANNER AS IN ALTERNATIVES 4A AND 4C. HOWEVER, THE CONTAMINATED GROUND WATER WOULD BE TREATED BY EVAPORATION, INSTEAD OF BY SEPARATE TREATMENT OPERATIONS COMBINED WITH DEEP WELL INJECTION. ALL CONTAMINANTS WOULD BE CONCENTRATED INTO TREATMENT RESIDUALS THAT WOULD HAVE TO BE DISPOSED OF OFF-SITE IN ACCORDANCE WITH US EPA'S OFF-SITE POLICY AND APPLICABLE RCRA AND DOT REQUIREMENTS. THE RESIDUALS WILL INCLUDE BLOW DOWN AND SALT CAKE. IN ADDITION, AIR STRIPPING AND CARBON ADSORPTION MAY BE REQUIRED PRIOR TO DISCHARGE OF THE CONDENSATE. AIR EMISSIONS WILL HAVE TO BE CONTROLLED TO MEET THE CRITERIA DESCRIBED IN SECTION X.

THE BLOW DOWN AND CARBON RESIDUALS WOULD LIKELY BE INCINERATED COMMERCIALY. CYANIDE, AND METALS IN THE GROUND WATER WOULD LIKELY BE CONCENTRATED IN THE SALT CAKE. IF THIS OCCURS, LAND DISPOSAL OF THE SALT CAKE WOULD LIKELY NOT BE ALLOWED UNDER THE LAND DISPOSAL RESTRICTIONS REGULATIONS WITHOUT PRIOR DESTRUCTION OF THE CYANIDE AND TREATMENT OF METALS (FR, VOL 53, NO 7). SEE TABLE 20.

THE FINAL SITE COVER AND HANDLING OF CONTAMINATED SEDIMENTS WOULD BE THE SAME AS IN ALTERNATIVES 4A AND 4C.

THE EVAPORATION SYSTEM MAY BE COMBINED WITH MIDCO II.

ALTERNATIVE 5A: SOIL VAPOR EXTRACTION, EXCAVATION ABOVE THE GROUND WATER ELEVATION AND LANDFILLING

THIS ALTERNATIVE AND ALTERNATIVES 5C, 5E AND 5G TREAT THE SOURCE AND SURFACE SEDIMENTS BUT NOT THE GROUND WATER.

SOIL VAPOR EXTRACTION (SVE):

A SOIL VAPOR EXTRACTION (SVE) OPERATION WOULD BE CONDUCTED TO TREAT THE VOLATILE ORGANIC COMPOUNDS IN THE SUBSURFACE SOIL. THIS WOULD REDUCE THE HAZARDS DUE TO AIR EMISSIONS DURING EXCAVATION AND HANDLING OF THE SOILS, AS WELL AS RISKS DUE TO LEACHING INTO GROUND WATER, DIRECT CONTACT AND DIRECT INGESTION. THE REQUIRED AREAL EXTENT OF TREATMENT AND DEGREE OF TREATMENT IS DEFINED IN SECTION X. EMISSIONS FROM THE SVE WOULD BE CONTROLLED TO THE DEGREE DEFINED IN SECTION X.

1. EXCAVATION AND OFF-SITE DISPOSAL:

FOLLOWING THIS OPERATION CONTAMINATED SUBSURFACE MATERIALS AND SURFACE SEDIMENTS WOULD BE EXCAVATED AND DISPOSED OF OFF-SITE. ALL OFF-SITE DISPOSAL, INCLUDING TREATMENT RESIDUALS FROM THE SVE, WOULD BE REQUIRED TO COMPLY WITH US EPA'S OFF-SITE POLICY AND APPLICABLE RCRA AND DOT REGULATIONS. IT APPEARS LIKELY THAT LDR UNDER 40 CFR 268 WOULD DISALLOW THIS ALTERNATIVE BECAUSE CYANIDE, CADMIUM, CHROMIUM, LEAD, NICKEL AND SILVER IN F007, F008 AND F009 WASTES WOULD NOT BE TREATED. THE LAND DISPOSAL RESTRICTIONS FOR F007, F008 AND F009 WASTES ARE SCHEDULED TO BECOME EFFECTIVE IN JUNE 1989. SVE ALSO MAY NOT PROVIDE ADEQUATE TREATMENT TO MEET THE LAND DISPOSAL RESTRICTIONS FOR F001, F002, F003 AND F005. THESE TREATMENT REQUIREMENTS ARE LISTED IN TABLES 19 AND 20 (THE STANDARDS FOR NON-WASTE WATERS WOULD BE APPLICABLE TO THE CONTAMINATED SOILS).

2. SITE COVER AND GROUND WATER:

THE SITE WOULD BE RESTORED TO GRADE WITH UNCONTAMINATED FILL. OVER A LONG PERIOD OF TIME, GROUND WATER MAY ATTENUATE TO BELOW CALS. HOWEVER, IN THE MEANTIME, THE GROUND WATER AT THE SITE WOULD BE HIGHLY CONTAMINATED AND WOULD CONTINUE TO MIGRATE OFF-SITE. IT MAY EVENTUALLY AFFECT GROUND WATER IN THE AREA SHOWN IN FIGURE 13. GROUND WATER USAGE RESTRICTIONS WOULD BE IMPOSED IN THIS AREA, AND NINETEEN GROUND WATER USERS (INCLUDING RESIDENTIAL DRINKING WATER WELLS) WOULD BE CONNECTED TO THE MUNICIPAL WATER SYSTEM. THIS ACTION WOULD BE CONSISTENT WITH RCRA GROUND WATER MONITORING REQUIREMENTS. IT WOULD BE INCONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS AND PRIMARY DRINKING WATER STANDARDS BECAUSE MCLS WOULD BE EXCEEDED IN OFF-SITE GROUND WATER. THE AWQC MAY BE EXCEEDED IN SURFACE WATERS DUE TO OFF-SITE MIGRATION OF THE GROUND

WATER.

THE SITE WOULD BE FENCED, DEED RESTRICTIONS IMPOSED AND GROUND WATER MONITORING IMPLEMENTED AS IN ALTERNATIVE 2.

ALTERNATIVE 5C: SOIL VAPOR EXTRACTION, EXCAVATION ABOVE WATER TABLE, INCINERATION AND ASH SOLIDIFICATION

1. SVE AND AIR EMISSIONS:

MEASURES WOULD BE TAKEN TO ENSURE THAT AIR EMISSIONS DURING EXCAVATION AND HANDLING OF THE SUBSURFACE MATERIAL DO NOT EXCEED THE CRITERIA FOR AIR EMISSIONS DEFINED IN SECTION X. THIS MAY REQUIRE THAT EXCAVATION AND HANDLING BE CONDUCTED DURING TIMES WHEN WEATHER CONDITIONS WOULD MINIMIZE THE VOLATILE ORGANIC EMISSIONS, AND THAT SPECIAL PROCEDURES BE FOLLOWED DURING EXCAVATION. ALTERNATIVELY, A SVE OPERATION MAY BE CONDUCTED AS DESCRIBED FOR ALTERNATIVE 5A PRIOR TO EXCAVATION.

IF SVE REMOVES THE VOLATILE ORGANIC COMPOUNDS, THE RISKS FROM DIRECT SOIL INGESTION, IN CASE THE SITE IS DEVELOPED, WOULD BE REDUCED AS FOLLOWS:

	BEFORE	AFTER
LIFETIME CARCINOGENIC*	6.8 X 10 ⁻⁵	6.0 X 10 ⁻⁵
CHRONIC NON-CARCINOGENIC INDEX*	3.6	3.4

* FROM ADDENDUM TO PUBLIC COMMENT DRAFT FEASIBILITY STUDY, MARCH 7, 1989. TABLE 4-22.

THE SUBCHRONIC HAZARD INDEX WOULD BE REDUCED FOR TOLUENE AND 2-BUTANONE BUT WOULD REMAIN ABOVE UNITY FOR LEAD, NICKEL, CYANIDE, AND BIS(2-ETHYLHEXYL) PHTHALATE (FROM REMEDIAL INVESTIGATION OF MIDWEST SOLVENT RECOVERY (MIDCO I). DECEMBER 1987. PP 6-58, 6-59 AND TABLE 6-20). THE RISKS DUE TO AIR EMISSIONS WOULD BE NEARLY ELIMINATED. IN ADDITION, THE POTENCY OF THE SOURCE FOR CONTINUING GROUND WATER CONTAMINATION WOULD BE REDUCED SUBSTANTIALLY, BUT NOT ELIMINATED.

2. INCINERATION:

FOLLOWING THE SOIL VAPOR CONTROL AND EXCAVATION OPERATIONS, THE CONTAMINATED SUBSURFACE SOILS AND SURFACE SEDIMENT MATERIAL WOULD BE INCINERATED. RCRA REGULATIONS BECOME APPLICABLE TO THE MATERIAL EXCAVATED AND TREATED. IT IS ANTICIPATED THAT THE INCINERATOR WOULD BE A TRANSPORTABLE, ROTARY-CELL TYPE, APPROXIMATELY THIRTY-EIGHT FEET LONG WITH A TEN-FOOT INNER DIAMETER.

THE INCINERATOR IS EXPECTED TO HAVE A CAPACITY OF APPROXIMATELY 17.5 TONS PER HOUR. A SECONDARY COMBUSTION CHAMBER WOULD BE USED TO ASSURE COMPLETE DESTRUCTION OF THE WASTES, AND A CAUSTIC SCRUBBER WOULD NEUTRALIZE ACIDIC FLUE GASES AND CONTROL PARTICULATE EMISSIONS. THE INCINERATOR WOULD HAVE TO MEET THE TESTING AND PERFORMANCE STANDARDS IN 40 CFR 264.341, 264.351, 264.343, 264.342, 7611.70 AND SPECIAL STATE OF INDIANA REQUIREMENTS INCLUDING A TEST BURN AND EXTENSIVE STACK SAMPLING.

THE INCINERATION SHOULD DESTROY NEARLY ALL THE ORGANIC COMPOUNDS AND CYANIDE. THE METALS WOULD LARGELY REMAIN IN THE ASH. THE REMAINING LIFETIME CARCINOGENIC RISK IN THE ASH DUE TO DIRECT SOIL INGESTION WOULD BE APPROXIMATELY 2.65 X 10⁻⁵ DUE TO ARSENIC. HOWEVER, THESE ARSENIC REPRESENT LEVELS OF BACKGROUND CONCENTRATIONS. THE REMAINING CUMULATIVE CHRONIC NON-CARCINOGENIC RISK DUE TO SOIL INGESTION WOULD BE LESS THAN 1.0 ASSUMING THAT CHROMIUM IS IN THE TRIVALENT FORM, BUT WOULD BE GREATER THAN 1.0 IF CHROMIUM IS IN THE HEXAVALENT FORM. THE SUBCHRONIC RISK INDEX WOULD REMAIN ABOVE ONE FOR LEAD AND NICKEL. THE METALS MAY OR MAY NOT BE IN A FORM THAT WOULD LEACH TO A SIGNIFICANT DEGREE.

THE INCINERATION AT MIDCO I MAY BE COMBINED WITH THE INCINERATION AT THE NEARBY NINTH AVENUE DUMP SITE. FOR PURPOSES OF RCRA AND THE US EPA OFF-SITE POLICY, THE COMBINED ACTION WOULD BE CONSIDERED ONE SITE.

THE INCINERATION PROCESS MUST SATISFY THE LDERS FOR NON-WASTE WATERS FOR LISTED WASTES NO. F001, F002, F003, F005, F007, F008, F009 (SEE TABLES 19 AND 20). HOWEVER, A CAPACITY VARIANCE IS IN EFFECT FOR SOIL, WASTE AND DEBRIS UNTIL NOVEMBER 1990 FOR WASTE CATEGORIES F001, F002, F003 AND F005.

SOLIDIFICATION:

FOLLOWING INCINERATION, THE CONCENTRATIONS OF SOME INORGANIC COMPOUNDS IN THE ASH WILL BE SIMILAR TO CONCENTRATIONS IN SOME LISTED HAZARDOUS WASTES FOR WHICH TREATMENT IS REQUIRED PRIOR TO LAND DISPOSAL. THIS IS SHOWN IN TABLE 9 IN THE APPENDIX. THEREFORE, SOLIDIFICATION STABILIZATION (S/S) OF THE ASH WILL BE REQUIRED FOLLOWING THE INCINERATION, UNLESS TCLP TESTS SHOW THAT HAZARDOUS CONSTITUENTS IN LEACHATE FROM THE UNSOLIDIFIED ASH ARE AT CONCENTRATIONS LESS THAN THE LDR TREATMENT STANDARDS REQUIRED UNDER THE 40 CFR 268 FOR F007, F008 AND F009 (SEE TABLE 10). FOLLOWING SOLIDIFICATION/STABILIZATION, THE SOLIDIFIED MASS MUST MEET THE LDR TREATMENT REQUIREMENTS FOR F001, F002, F003, F005, F007, F008 AND F009, OR MUST MEET STANDARDS FOR A TREATABILITY VARIANCE IF THIS IS APPROVED PURSUANT TO 40 CFR 268.44.

IN ADDITION, IF THE ASH IS A HAZARDOUS WASTE BY CHARACTERISTIC, D004, D005, D006, D007, D008, D009 AND D010, LAND DISPOSAL RESTRICTIONS FOR THESE WASTES MAY BE APPLICABLE AT THE TIME OF THE ACTION.

SITE COVER AND GROUND WATER:

THE INCINERATED/SOLIDIFIED MATERIAL WOULD BE PLACED ON-SITE. THE DESIGN OF THE FINAL COVER WOULD DEPEND ON THE RESULTS OF THE LEACHATE TESTS ON THE ASH OR SOLIDIFIED MATERIAL. IF THE WASTE IS DELISTABLE, A TWO-FOOT SOIL COVER WOULD BE PLACED OVER THE SITE. IF NOT, A FINAL COVER IN COMPLIANCE WITH APPLICABLE RCRA LANDFILL CLOSURE REQUIREMENTS WOULD BE INSTALLED. IT IS ANTICIPATED THAT IF S/S IS NOT REQUIRED, THE FINAL COVER WILL PROVIDE ADEQUATE PROTECTION AGAINST THE DIRECT CONTACT RISK.

AS IN ALTERNATIVE 5A, GROUND WATER MONITORING, USAGE RESTRICTIONS AND MUNICIPAL WATER CONNECTIONS WOULD BE IMPLEMENTED. THIS ALTERNATIVE WOULD BE INCONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS AND PRIMARY DRINKING WATER REGULATIONS.

ALTERNATIVE 5E: VAPOR EXTRACTION AND SOLIDIFICATION

TWO METHODS OF MIXING FOR SOLIDIFICATION ARE AVAILABLE. ONE INVOLVES EXCAVATION, MIXING ABOVE GROUND AND REPLACEMENT OF THE SOLIDIFIED MATERIAL ON-SITE; THE SECOND INVOLVES IN-SITU ADDITION OF REAGENTS AND MIXING.

1. ABOVE GROUND MIXING:

IF ABOVE GROUND MIXING IS USED, THEN A SOIL VAPOR EXTRACTION OPERATION AS DESCRIBED FOR ALTERNATIVE 5A MUST BE COMPLETED PRIOR TO EXCAVATION.

FOLLOWING THE SOIL VAPOR EXTRACTION, THE RESIDUAL RISKS MAY BE AS DESCRIBED FOR ALTERNATIVE 5C.

FOLLOWING THIS OPERATION, SUBSURFACE MATERIALS ABOVE THE GROUND WATER TABLE AND SURFACE SEDIMENTS THAT EXCEED SOIL CALS WOULD BE EXCAVATED, MIXED WITH WATER, BINDER AND REAGENTS IN A TANK AND THEN PLACED BACK ON SITE TO CURE. IT IS ANTICIPATED THAT THE CONTAMINATED MATERIALS WOULD BE FED TO THE MIXER AT A MAXIMUM RATE OF 75 CUBIC YARDS PER HOUR. LARGE ITEMS SUCH AS STUMPS WOULD BE SIFTED OUT AND SANDWICHED INSIDE LAYERS OF SOLIDIFIED MATERIAL ON THE SITE.

ONCE THE CONTAMINATED SUBSURFACE MATERIALS AND SEDIMENTS ARE EXCAVATED AND TREATED, THE RCRA REGULATIONS BECOME APPLICABLE. PURSUANT TO 40 CFR 268, LAND DISPOSAL OF THE SOLIDIFIED MATERIAL WOULD NOT BE ALLOWED UNLESS THE LDR TREATMENT STANDARDS ARE ATTAINED (SEE TABLES 19 AND 20), OR TREATABILITY VARIANCE TREATMENT STANDARDS ARE ATTAINED (SEE TABLE 21) (40 CFR 268.44). UNTIL NOVEMBER 1990, THERE ARE NO LDR TREATMENT STANDARDS IN EFFECT FOR WASTE CATEGORIES F001, F002, F003 AND F005 IN SOIL, WASTE AND DEBRIS BECAUSE OF A CAPACITY VARIANCE.

THE PROPOSED LDR TREATMENT STANDARDS FOR CYANIDE REQUIRE DESTRUCTION OF CYANIDE RATHER THAN REDUCTION IN MOBILITY. BECAUSE IT MAY BE IMPOSSIBLE TO MEET THE LDR TREATMENT STANDARD FOR CYANIDE BY S/S, AND BECAUSE EXISTING AVAILABLE DATA DO NOT DEMONSTRATE THAT FULL-SCALE OPERATION OF S/S CAN ATTAIN THE LDR TREATMENT STANDARDS CONSISTENTLY FOR ALL SOIL AND DEBRIS AT THIS SITE, THIS ALTERNATIVE WILL COMPLY WITH THE LDRS THROUGH A TREATABILITY VARIANCE. THE REQUIRED TREATMENT STANDARDS (BASED ON RESULTS OF TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP) TESTS) ARE SUMMARIZED IN TABLE 21. CONSTITUENTS THAT ARE NOT LISTED IN TABLE 21 SHOULD BE REDUCED IN MOBILITY BY 90% BASED ON TCLP TESTS.

LAND DISPOSAL RESTRICTIONS APPLICABLE TO HAZARDOUS WASTES BY CHARACTERISTIC (D003, D004, D005, D006, D007, D008, D009, D010) MAY ALSO BECOME APPLICABLE TO THE OPERATION BY THE TIME S/S IS IMPLEMENTED.

2. IN-SITU MIXING:

AS AN ALTERNATIVE TO EXCAVATION AND SOLIDIFICATION, THE SUBSURFACE SOIL WOULD BE SOLIDIFIED IN-SITU. IT IS ANTICIPATED THAT THE SYSTEM WOULD UTILIZE A CRANE-MOUNTED MIXING SYSTEM. THE MIXING HEAD WOULD BE ENCLOSED IN A BOTTOM-OPENED CYLINDER TO ALLOW CLOSED SYSTEM MIXING OF THE TREATMENT CHEMICALS WITH THE SOIL. THE BOTTOM-OPENED CYLINDER WOULD BE LOWERED ONTO THE SOIL AND THE MIXING BLADES WOULD BE STARTED, MOVING THROUGH THE DEPTH IN AN UP AND DOWN MOTION, WHILE CHEMICALS ARE INTRODUCED. VAPORS AND DUST WOULD BE PULLED INTO THE VAPOR TREATMENT SYSTEM, COMPOSED OF A DUST COLLECTION SYSTEM FOLLOWED BY IN-LINE ACTIVATED CARBON TREATMENT. AN INDUCED DRAFT FAN WOULD EXHAUST THE TREATED AIR TO THE ATMOSPHERE. AT THE COMPLETION OF A MIXING, THE BLADES WOULD BE WITHDRAWN AND THE CYLINDER REMOVED. THE CYLINDER WOULD THEN BE PLACED ADJACENT TO AND OVERLAPPING THE PREVIOUS CYLINDER. THIS WOULD BE REPEATED UNTIL THE ENTIRE AREA HAS BEEN TREATED.

THE SURFACE SEDIMENTS WOULD BE SCRAPED UP AND CONSOLIDATED ON-SITE FOR SOLIDIFICATION.

PRIOR TO IN-SITU SOLIDIFICATION, A SOIL VAPOR EXTRACTION OPERATION MAY HAVE TO BE CONDUCTED TO REDUCE VOLATILE ORGANIC COMPOUNDS ENOUGH SO THAT EMISSIONS DURING MIXING AND CURING (AFTER THE VAPOR TREATMENT SYSTEM IS REMOVED) MEET THE CRITERIA FOR AIR EMISSIONS AND SO THAT LEACHATE FROM THE SOLIDIFIED MASS WILL NOT CAUSE EXCEEDANCE OF THE GROUND WATER CALS FOR VOLATILE ORGANIC COMPOUNDS (SECTION X).

USING IN-SITU MIXING, THE LDRS WOULD NOT BE APPLICABLE NOR CONSIDERED TO BE RELEVANT AND APPROPRIATE. THE S/S WILL BE CONSIDERED SUCCESSFUL IF IT REDUCES THE MOBILITY OF CONTAMINANTS SO THAT LEACHATE FROM THE SOLID MASS WILL NOT CAUSE EXCEEDANCE OF CLEANUP ACTION LEVELS IN THE GROUND WATER (SEE SECTION X).

3. RESIDUAL RISKS:

IF THE VAPOR EXTRACTION/SOLIDIFICATION OPERATION IS SUCCESSFUL, THE EXPOSURES DUE TO AIR EMISSIONS, DIRECT SOIL INGESTION AND LEACHING TO GROUND WATER SHOULD BE NEARLY ELIMINATED.

THE SVE, BY ITSELF, SHOULD REMOVE AND TREAT MOST OF THE VOLATILE ORGANIC COMPOUNDS. THE RESIDUAL RISKS FOLLOWING SVE ARE DESCRIBED FOR ALTERNATIVE 5C. USING SOLIDIFICATION, THE MOBILITY OF HAZARDOUS CONSTITUENTS WOULD BE REDUCED THROUGH BINDING OR ENTRAPMENT OF HAZARDOUS CONSTITUENTS IN A SOLID MASS WITH LOW PERMEABILITY THAT RESISTS LEACHING. S/S HAS BEEN SELECTED AS THE BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) OR PART OF A BDAT FOR TREATMENT OF A NUMBER OF RCRA HAZARDOUS WASTES FOR THE LAND DISPOSAL RESTRICTIONS (40 CFR 268). THESE INCLUDE THE FOLLOWING LISTED HAZARDOUS WASTES: F006, K001, K015, K022, K048, K049, K050, K051, K052, K061, K086, K087, K101. THESE LISTED HAZARDOUS WASTES CONTAIN THE FOLLOWING HAZARDOUS CONSTITUENTS: CADMIUM, CHROMIUM, LEAD, NICKEL, SILVER, ARSENIC, AND SELENIUM (40 CFR 268, PROMULGATED AUGUST 17, 1988). S/S IS CONSIDERED A POTENTIALLY APPLICABLE TECHNOLOGY FOR TREATMENT OF HAZARDOUS WASTES BY CHARACTERISTIC NUMBERS D004, D005, D006, D007, D008, AND D010, WHICH CONTAIN ARSENIC, BARIUM, CADMIUM, CHROMIUM, LEAD, AND SELENIUM (FR, VOL 54, NO 7, P 1098-1099).

THE S/S PROCESS HAS WEAKNESSES. SOME CONSTITUENTS INTERFERE WITH THE BONDING WITH WASTE MATERIALS. THIS INCLUDES HIGH ORGANIC CONTENT (GREATER THAN 45% BY WEIGHT), SEMIVOLATILE ORGANIC COMPOUNDS GREATER THAN 1.0%, CYANIDE GREATER THAN 3,000 PPM, AND HIGH OIL AND GREASE (GREATER THAN 10%). SVE SHOULD REDUCE THOSE VOLATILE AND SEMI-VOLATILE ORGANIC COMPOUNDS. IN ADDITION, HALIDE MAY RETARD SETTING, AND SOLUBLE MANGANESE, TIN, ZINC, COPPER AND LEAD SALTS INCREASE THE LEACHABILITY POTENTIAL (TECHNOLOGY SCREENING GUIDE FOR TREATMENT OF CERCLA SOILS AND SLUDGES, EPA/540/2-88/004 SEPT 1988). MIDCO I SUBSURFACE MATERIALS CONTAIN HALIDE; ELEVATED ZINC, MANGANESE, COPPER AND LEAD; SEMIVOLATILE COMPOUNDS UP TO 0.8%, AND CYANIDE UP TO 2720 PPM.

IN ADDITION, THE LONG TERM INTEGRITY OF THE SOLIDIFIED MATERIAL IS NOT WELL DOCUMENTED BECAUSE FEW PROJECTS HAVE BEEN IN PLACE FOR LONG PERIODS OF TIME. THIS IS OF CONCERN BECAUSE ORGANIC CONSTITUENTS ARE USUALLY NOT CONSIDERED TO BE TREATED BY THIS PROCESS BUT ONLY ENCAPSULATED. THERE IS VERY LITTLE DATA AVAILABLE ON THE APPLICABILITY OF S/S TO CYANIDE WASTES. IN ONE STUDY, THE MOBILITY OF ARSENIC WAS INCREASED BY ORDERS OF MAGNITUDE BY THE S/S. CHROMIUM AND ARSENIC ARE DIFFICULT TO SOLIDIFY AND MAY REQUIRE SPECIALIZED BINDERS. ORGANIC LEAD MAY NOT BE EFFECTIVELY TREATED BY S/S (FR, VOL 54, NO 7, PP 1098, 1099).

THEREFORE, US EPA CANNOT BE SURE HOW SUCCESSFUL S/S WILL BE AT MIDCO I UNTIL TREATABILITY TESTS ARE COMPLETED. THESE TESTS ARE BEING INITIATED. IN ADDITION, TREATABILITY TESTS ARE NEEDED TO DETERMINE THE PROPER FORMULATION FOR THE SOLIDIFICATION REAGENTS.

4. FINAL SITE COVER:

IF THE SUBSURFACE MATERIALS ARE EXCAVATED, RCRA HAZARDOUS WASTE REGULATIONS BECOME APPLICABLE, AND THE FINAL SITE COVER MUST MEET RCRA LANDFILL CLOSURE REQUIREMENTS, UNLESS THE WASTE IS DELISTED PURSUANT TO 40 CFR 260.22. HOWEVER, RCRA DOES NOT PRESENTLY UTILIZE LEACH TESTS IN DELISTING PROCEDURES FOR ORGANIC COMPOUNDS. THE FINAL SITE COVER MUST ALSO PROTECT THE SOLIDIFIED MATERIAL FROM DEGRADATION DUE TO

ENVIRONMENTAL FACTORS SUCH AS ACID RAIN AND THE FREEZE-THAW CYCLE.

IF IN-SITU MIXING IS USED, RCRA LANDFILL CLOSURE REQUIREMENTS ARE NOT APPLICABLE. HOWEVER, THESE REQUIREMENTS MAY BE CONSIDERED RELEVANT AND APPROPRIATE BY US EPA DEPENDING ON THE RESULTS OF THE TREATABILITY STUDY. AT A MINIMUM, THE COVER MUST PROTECT THE SOLIDIFIED MATERIAL FROM ENVIRONMENTAL DEGRADATION, MINIMIZE MAINTENANCE, PROMOTE DRAINAGE, AND MINIMIZE EROSION.

5. GROUND WATER AND ACCESS:

GROUND WATER USAGE RESTRICTIONS, WELL CONNECTIONS, DEED RESTRICTIONS, ACCESS RESTRICTIONS AND MONITORING WOULD BE IMPLEMENTED AS IN ALTERNATIVE 5A. THIS ALTERNATIVE WOULD BE INCONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS AND PRIMARY DRINKING WATER REGULATIONS.

ALTERNATIVE 5G: IN-SITU VITRIFICATION

IN THIS THERMAL TREATMENT PROCESS, A SQUARE ARRAY OF FOUR ELECTRODES ARE INSERTED INTO THE GROUND TO THE DESIRED TREATMENT DEPTH OF 4.5 FEET. A CONDUCTIVE MIXTURE OF FLAKED GRAPHITE AND GLASS FRIT IS PLACED AMONG THE ELECTRODES AS A PATH FOR THE CURRENT. VOLTAGE IS APPLIED TO THE ELECTRODES TO ESTABLISH A CURRENT IN THE STARTER PATH. THE RESULTANT POWER HEATS THE STARTER PATH AND SURROUNDING SOIL UP TO 3600 DEGREES F. THE SOIL BECOMES MOLTEN AT TEMPERATURES BETWEEN 2000 DEGREES AND 2500 DEGREES F. AS THE VITRIFIED ZONE GROWS IT INCORPORATES NON-VOLATILE ELEMENTS AND DESTROYS ORGANIC COMPOUNDS BY PYROLYSIS. PYROLYZED PRODUCTS MOVE TO THE SURFACE WHERE THEY COMBUST. A HOOD OVER THE PROCESS COLLECTS OFF-GASES FOR TREATMENT. THE HOOD REMAINS OVER THE MELT UNTIL GASSING STOPS, IN APPROXIMATELY FOUR DAYS. THUS, TWO HOODS ARE REQUIRED FOR SEQUENTIAL BATCH PROCESSING. THE VITRIFIED MASS IS LEFT IN PLACE AND ANY SUBSIDENCE IS BACKFILLED WITH CLEAN FILL AND SEEDED. IN ADDITION, CONTAMINATED SEDIMENTS WOULD BE SCRAPED AND TRANSPORTED TO THE SITE FOR VITRIFICATION.

THE ADVANTAGES OF IN-SITU VITRIFICATION INCLUDE THAT EXCAVATION ISN'T REQUIRED (EXCEPT FOR SURFACE SEDIMENTS, WHICH WOULD BE SCRAPED UP AND CONSOLIDATED ON-SITE FOR VITRIFICATION), AIR EMISSIONS ARE CONTROLLED IN PLACE, ORGANIC COMPOUNDS ARE DESTROYED AND INORGANIC COMPOUNDS ARE INCORPORATED INTO A GLASSY SOLID MATRIX RESISTANT TO LEACHING AND MORE DURABLE THAN GRANITE OR MARBLE (TECHNOLOGY SCREENING GUIDE FOR TREATMENT OF CERCLA SOILS AND SLUDGES, EPA/540/2-88/004, SEPT 1988).

DISADVANTAGES OF IN-SITU VITRIFICATION INCLUDE THAT, ALTHOUGH IT HAS BEEN TESTED IN PILOT STUDIES, IT HAS NOT BEEN DEMONSTRATED IN A FULL SCALE COMMERCIAL APPLICATION. IN ADDITION, THE COMMERCIAL AVAILABILITY OF THE EQUIPMENT IS LIMITED. THE PRESENCE OF GROUND WATER ONLY FIVE FEET BELOW THE SURFACE SEVERELY LIMITS THE ECONOMIC PRACTICABILITY BECAUSE OF THE ENERGY EXPENDED IN DRIVING OFF WATER. THE PRESENCE OF BURIED METALS AND COMBUSTIBLE SOLIDS BELOW THE SURFACE MAY ALSO CAUSE PROBLEMS IN THE OPERATION (TECHNOLOGY SCREENING GUIDE FOR TREATMENT OF CERCLA SOILS AND SLUDGES, EPA/540/2-88/004, SEPT 1988).

BECAUSE THE ORGANIC COMPOUNDS ARE DESTROYED AND INORGANIC COMPOUNDS INCORPORATED INTO A SOLID MASS RESISTANT TO LEACHING, IT IS EXPECTED THAT THE TREATED MATERIAL WILL BE DELISTABLE. IF TESTS SHOW THAT THE RESIDUE IS DELISTABLE, ONLY A SOIL COVER WOULD BE PLACED OVER THE SITE.

GROUND WATER USAGE RESTRICTIONS, WELL CONNECTIONS, DEED RESTRICTIONS, ACCESS RESTRICTIONS AND MONITORING WOULD BE IMPLEMENTED AS IN ALTERNATIVE 5A. THIS ALTERNATIVE WOULD BE INCONSISTENT WITH RCRA CORRECTIVE ACTION REQUIREMENTS AND PRIMARY DRINKING WATER REGULATIONS.

ALTERNATIVE 6: CONTAINMENT WITH SOIL VAPOR EXTRACTION AND SOLIDIFICATION

THIS ALTERNATIVE COMBINES THE SOURCE TREATMENT MEASURES IN ALTERNATIVE 5E WITH THE CONTAINMENT MEASURES IN ALTERNATIVE 3. THE ADVANTAGE OF THIS ALTERNATIVE OVER ALTERNATIVE 3 ALONE IS THAT THE RISKS FROM RESIDUAL SUBSURFACE SOIL CONTAMINATION WITHIN THE CONTAINMENT BARRIER WOULD BE NEARLY ELIMINATED. THE CONTAMINANTS IN THE GROUND WATER WOULD REMAIN BUT THEY WOULD BE CONTAINED WITHIN THE SLURRY WALL.

SHOULD THE SLURRY WALL FAIL, THE GROUND WATER IN THE AREA SHOWN IN FIGURE 13 MAY EVENTUALLY BE AFFECTED. ALTHOUGH THE CONTAMINATION MAY EVENTUALLY ATTENUATE, THE RISKS FROM INGESTION OF GROUND WATER ON THE SITE ITSELF WOULD REMAIN VERY HIGH FOR A LONG TIME.

THE SOIL VAPOR EXTRACTION OPERATION WOULD REMOVE THE PRIMARY SOURCE OF GROUND WATER CONTAMINATION ALTHOUGH THE REMAINING SEMI-VOLATILE COMPOUNDS AND METALS COULD BE A CONTINUING SOURCE OF GROUND WATER CONTAMINATION. ASSUMING THAT THE SOIL VAPOR EXTRACTION REMOVES ALL VOLATILE ORGANIC COMPOUNDS, THE RISKS FROM DIRECT SOIL INGESTION IN CASE THE SITE IS DEVELOPED WOULD BE REDUCED AS FOLLOWS:

	BEFORE	AFTER
LIFETIME CARCINOGENIC*	6.8 X 10 ⁻⁵	6.0 X 10 ⁻⁵
CHRONIC NON-CARCINOGENIC INDEX*	3.6	3.4

* FROM ADDENDUM TO PUBLIC COMMENT DRAFT FEASIBILITY STUDY, MARCH 7, 1989, TABLE 4-22.

THE SUBCHRONIC HAZARD INDEX WOULD BE REDUCED FOR TOLUENE AND 2-BUTANONE BUT WOULD REMAIN ABOVE UNITY FOR LEAD, NICKEL, CYANIDE, AND BIS(2-ETHYLHEXYL) PHTHALATE (FROM REMEDIAL INVESTIGATION OF MIDWEST SOLVENT RECOVERY (MIDCO I) DECEMBER 1987. PP 6-58, 6-59, TABLE 6-20).

RISKS FROM AIR EMISSIONS FROM THE SOURCE, IN CASE THE CAP IS DISTURBED, WOULD BE ELIMINATED.

IF SUCCESSFUL, THE S/S PROCESS WOULD NEARLY ELIMINATE THE REMAINING RISKS DUE TO THE SOURCE.

ALTERNATIVE 7: GROUND WATER PUMPING AND DEEP WELL INJECTION WITH SOIL VAPOR EXTRACTION AND SOLIDIFICATION

THIS ALTERNATIVE COMBINES THE SOURCE TREATMENT MEASURES IN ALTERNATIVE 5E WITH THE GROUND WATER TREATMENT MEASURES IN ALTERNATIVE 4A.

AT THE CONCLUSION OF THIS ACTION, THE SITE WOULD BE CLOSE TO MEETING RCRA CLEAN CLOSURE REQUIREMENTS. HOWEVER, LONG-TERM MONITORING AND MAINTENANCE WOULD BE REQUIRED BECAUSE THE LONG-TERM EFFECTIVENESS OF S/S IS NOT WELL DOCUMENTED.

ALTERNATIVE 8: GROUND WATER PUMPING, TREATMENT AND DEEP WELL INJECTION WITH SOIL VAPOR EXTRACTION AND SOLIDIFICATION

THIS ALTERNATIVE COMBINES THE SOURCE TREATMENT MEASURES IN ALTERNATIVE 5E WITH THE GROUND WATER TREATMENT MEASURES IN ALTERNATIVE 4C.

AT THE CONCLUSION OF THIS ACTION, THE SITE WOULD BE CLOSE TO MEETING RCRA CLEAN CLOSURE REQUIREMENTS. HOWEVER, LONG-TERM MONITORING WOULD BE REQUIRED BECAUSE THE LONG TERM EFFECTIVENESS OF S/S IS NOT WELL DOCUMENTED.

ALTERNATIVE 9: GROUND WATER PUMPING AND EVAPORATION WITH SOIL VAPOR EXTRACTION AND SOLIDIFICATION

THIS ALTERNATIVE COMBINES THE SOURCE TREATMENT MEASURES IN ALTERNATIVE 5E WITH THE GROUND WATER TREATMENT MEASURES IN ALTERNATIVE 4E.

AT THE CONCLUSION OF THIS ACTION, THE SITE WOULD BE CLOSE TO MEETING RCRA CLEAN CLOSURE REQUIREMENTS. HOWEVER, LONG-TERM MONITORING WOULD BE REQUIRED BECAUSE THE LONG-TERM EFFECTIVENESS OF S/S IS NOT WELL DOCUMENTED.

#SCAA

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

IN SELECTING THE FINAL REMEDIAL ACTIONS FOR SUPERFUND SITES, US EPA CONSIDERS THE FOLLOWING NINE CRITERIA:

1. OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT: ADDRESSES WHETHER OR NOT A REMEDY PROVIDES ADEQUATE PROTECTION, AND DESCRIBES HOW RISKS ARE ELIMINATED, REDUCED OR CONTROLLED THROUGH TREATMENT, ENGINEERING CONTROLS, OR INSTITUTIONAL CONTROLS.
2. COMPLIANCE WITH ARARS: ADDRESSES WHETHER OR NOT A REMEDY WILL MEET ALL OF THE APPLICABLE OR RELEVANT AND APPROPRIATE (ARARS) REQUIREMENTS OF OTHER ENVIRONMENTAL STATUTES AND/OR PROVIDE GROUNDS FOR INVOKING A WAIVER.
3. LONG-TERM EFFECTIVENESS AND PERMANENCE: REFERS TO THE ABILITY OF A REMEDY TO MAINTAIN RELIABLE PROTECTION OF HUMAN HEALTH AND THE

ENVIRONMENT OVER TIME ONCE CLEANUP GOALS HAVE BEEN MET.

4. REDUCTION OF TOXICITY, MOBILITY, OR VOLUME (TMV): IS THE ANTICIPATED PERFORMANCE OF THE TREATMENT TECHNOLOGIES A REMEDY MAY EMPLOY.
5. SHORT-TERM EFFECTIVENESS: INVOLVES THE PERIOD OF TIME NEEDED TO ACHIEVE PROTECTION FROM ANY ADVERSE IMPACTS ON HUMAN HEALTH AND THE ENVIRONMENT THAT MAY BE POSED DURING THE CONSTRUCTION AND IMPLEMENTATION PERIOD UNTIL CLEANUP GOALS ARE ACHIEVED.
6. IMPLEMENTABILITY: IS THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF A REMEDY, INCLUDING THE AVAILABILITY OF GOODS AND SERVICES NEEDED TO IMPLEMENT THE CHOSEN SOLUTION.
7. COST: INCLUDES CAPITAL AND OPERATION AND MAINTENANCE COSTS.
8. SUPPORT AGENCY ACCEPTANCE: INDICATES WHETHER, BASED ON ITS REVIEW OF THE RI/FS AND PROPOSED PLAN, THE STATE AGENCY (THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT) CONCURS, OPPOSES, OR HAS NO COMMENT ON THE PREFERRED ALTERNATIVE.
9. COMMUNITY ACCEPTANCE: WILL BE ASSESSED FROM THE PUBLIC COMMENTS RECEIVED.

THESE NINE CRITERIA INCORPORATE FACTORS REQUIRED TO BE ADDRESSED IN THE REMEDY SELECTION PROCESS IN SARA SECTION 121.

A COMPARISON OF THE FOURTEEN ALTERNATIVES USING THE NINE CRITERIA IS INCLUDED IN TABLES 10, 11 AND 12. A COMPARISON OF COSTS AMONG THE FOURTEEN ALTERNATIVES IS IN TABLE 13. TABLE 14 COMPARES SOME MAJOR FACTORS CONSIDERED IN THE EFFECTIVENESS EVALUATION AMONG THE FOURTEEN ALTERNATIVES. THESE TABLES ARE INCLUDED IN THE APPENDIX.

THE NO-ACTION ALTERNATIVE (1) IS UNACCEPTABLE BECAUSE ARARS FOR GROUNDWATER AND SURFACE WATERS WOULD BE EXCEEDED AND HUMAN HEALTH AND ENVIRONMENTAL RISKS FROM CONTINUED AIR EMISSIONS AND GROUNDWATER MIGRATION WILL BE UNACCEPTABLE.

ALTERNATIVES THAT ADDRESS ONLY THE SOURCE (ALTERNATIVES 2, 5A, 5C, AND 5G) ARE UNACCEPTABLE BECAUSE ALTHOUGH GROUNDWATER AND SURFACE WATER CONTAMINATION MAY EVENTUALLY ATTENUATE, THIS WILL TAKE MANY YEARS (ESTIMATE 60-117 YEARS). IN THE MEANTIME, ARARS FOR THE GROUNDWATER AND SURFACE WATER WOULD BE EXCEEDED, THE GROUNDWATER PLUME WOULD EVENTUALLY AFFECT A LARGE AREA, AND BIOTA MAY BE ADVERSELY AFFECTED BY GROUNDWATER RECHARGE TO SURFACE WATERS AND AIR EMISSIONS. IN ADDITION, PROTECTION FROM FUTURE GROUNDWATER USAGE, WOULD REQUIRE USAGE RESTRICTIONS IN A FAIRLY LARGE AREA. THIS WOULD BE DIFFICULT TO IMPLEMENT.

THE CONTAINMENT ALTERNATIVES 3 AND 6 WOULD PROVIDE PROTECTION TO HUMAN HEALTH AND THE ENVIRONMENT FOR AS LONG AS THE SITE CAP AND SLURRY WALL ARE MAINTAINED. HOWEVER, THE HIGH SALT AND ORGANIC CONCENTRATIONS MAY AFFECT THE PERMEABILITY OF THE SLURRY WALL, RESULTING IN THE NEED TO REPLACE IT IN THE LONG TERM. IF FUTURE DEVELOPMENT OCCURS OR THE CAP OR SLURRY WALL ARE DAMAGED, THE RESULTING HEALTH RISKS MAY BE SIMILAR TO NO ACTION FOR ALTERNATIVE 3, AND TO ALTERNATIVES ADDRESSING ONLY THE SOURCE FOR ALTERNATIVE 6. COSTS FOR REMEDYING SUCH A FAILURE WOULD BE SIMILAR TO BUT HIGHER THAN THE ORIGINAL INSTALLATION. IN THAT CASE, THE TOTAL COST FOR A CONTAINMENT ALTERNATIVE WOULD BE SIMILAR TO THE COST FOR REMEDIAL ACTIONS THAT TREAT BOTH THE SOURCE AND THE GROUND WATER.

ALTERNATIVES THAT INCLUDE ONLY TREATMENT OF THE GROUND WATER (4A, 4C, 4E) WOULD ATTAIN A CONSIDERABLE DEGREE OF PERMANENT PROTECTION. CONTAMINANTS PRESENTLY IN THE GROUND WATER AND CONTAMINANTS THAT ARE FLUSHED INTO THE GROUND WATER WOULD BE REDUCED IN TOXICITY, MOBILITY, AND VOLUME (TMV) BY OPERATION OF THE GROUND WATER TREATMENT SYSTEM OVER A LONG PERIOD OF TIME.

THE SITE COVER AND ACCESS RESTRICTIONS WOULD PROTECT AGAINST ON-SITE DIRECT INGESTION AND DIRECT CONTACT RISKS.

AT THE COMPLETION OF THE GROUND WATER ACTION, RESIDUAL CONTAMINATION WILL REMAIN UNDER THE SITE COVER, ALTHOUGH IT WILL BE REDUCED FROM THE PRESENT CONDITIONS. IT IS UNCERTAIN WHAT RESIDUAL RISKS WILL REMAIN. IT IS POSSIBLE THAT MOBILE CONTAMINANTS WILL REMAIN UNDER THE COVER AFTER COMPLETION OF THE GROUND WATER TREATMENT ACTIONS. IF THE COVER IS SUBSEQUENTLY DISTURBED OR DEGRADED, THESE RESIDUALS WILL AGAIN CAUSE

GROUND WATER CONTAMINATION. EVEN IF RELATIVELY MOBILE COMPONENTS, SUCH AS VOLATILE ORGANIC COMPOUNDS, PHENOL AND CYANIDE ARE FLUSHED FROM THE SOIL, THE RESIDUAL RISKS DUE TO DIRECT INGESTION IN CASE OF FUTURE DEVELOPMENT WOULD BE: 6.0×10^{-5} LIFETIME CARCINOGENIC RISK, WITH A CHRONIC NON-CARCINOGENIC INDEX = 1.1 IF CHROMIUM IS TRIVALENT, AND 3.1 IF CHROMIUM IS HEXAVALENT. SUBCHRONIC RISKS FROM LEAD, NICKEL, AND BIS(2-ETHYLHEXYL)PHATHATE WOULD LIKELY REMAIN. IN ADDITION, LEAD AND CHROMIUM ARE PRESENT IN SOME OF THE SUBSURFACE MATERIAL AT CONCENTRATIONS SIMILAR TO THOSE IN SOME LISTED HAZARDOUS WASTES, FOR WHICH TREATMENT IS REQUIRED PRIOR TO LAND DISPOSAL PURSUANT TO 40 CFR 268 (SEE TABLE 9).

FOR THESE REASONS, AN ALTERNATIVE THAT COMBINES A SOURCE TREATMENT MEASURE WITH A GROUND WATER TREATMENT MEASURE IS NEEDED. OF THE SOURCE TREATMENT MEASURES, SOIL VAPOR EXTRACTION (SVE) BY ITSELF WOULD REDUCE A LARGE PORTION OF THE RISKS FROM FUTURE RELEASES TO GROUND WATER, AIR EMISSIONS, AND REDUCE THE DIRECT INGESTION RISK TO A SIGNIFICANT DEGREE. THIS IS EXPLAINED IN THE DISCUSSION FOR ALTERNATIVE 6. HOWEVER, FOLLOWING SVE, RESIDUAL RISKS WILL REMAIN, AND LEAD AND CHROMIUM WILL BE PRESENT IN SOME SUBSURFACE MATERIALS AT CONCENTRATIONS SIMILAR TO THOSE IN SOME LISTED HAZARDOUS WASTES, FOR WHICH TREATMENT IS REQUIRED PRIOR TO LAND DISPOSAL PURSUANT TO 40 CFR 268 (SEE TABLE 9). SVE COMBINED WITH S/S WOULD ADDRESS ALL RISKS DUE TO THE SOURCE IF THEY ARE SUCCESSFUL. THE EFFECTIVENESS OF S/S AT MIDCO I WOULD BE EVALUATED BY TREATABILITY TESTS PRIOR TO ITS IMPLEMENTATION.

COMPARED TO SVE AND S/S, INCINERATION WOULD MORE RELIABLY AND PERMANENTLY TREAT THE ORGANIC COMPOUNDS, IT ALSO MAY MAKE SUBSEQUENT SOLIDIFICATION EASIER. HOWEVER, INCINERATION IS CONSIDERABLY MORE EXPENSIVE THAN SVE AND S/S, AND, IF S/S IS SUCCESSFUL, INCINERATION WOULD DO LITTLE TO FURTHER REDUCE RISKS.

VITRIFICATION, IF IT WORKED, WOULD MORE RELIABLY ADDRESS BOTH THE ORGANIC AND INORGANIC CONTAMINANTS. IT ALSO TREATS BOTH ORGANIC AND INORGANIC COMPOUNDS IN ONE OPERATION, WHICH IS AN ADVANTAGE. HOWEVER, THERE IS A LARGE DEGREE OF UNCERTAINTY ABOUT WHETHER VITRIFICATION IS PRACTICAL AT THIS SITE BECAUSE OF THE HIGH WATER TABLE. IN ADDITION, IT IS ESTIMATED TO BE CONSIDERABLY MORE EXPENSIVE THAN SVE COMBINED WITH S/S AND, IF S/S IS SUCCESSFUL, WOULD DO LITTLE TO FURTHER REDUCE RISKS.

ALL THE GROUND WATER TREATMENT ALTERNATIVES WOULD RESULT IN ATTAINING ARARS AND PROVIDING LONG-TERM PROTECTION OF THE CALUMET AQUIFER AT THE SITE WHEN COMBINED WITH A SOURCE TREATMENT ALTERNATIVE. THEY DIFFER ONLY IN THEIR METHOD OF TREATMENT AND DISPOSAL OF THE HIGHLY SALINE CONTAMINATED GROUND WATER. THE TREATMENT AND DEEP WELL INJECTION OR REINJECTION INTO THE CALUMET AQUIFER ALTERNATIVE (4C) MAY SUBSTANTIALLY REDUCE TMV OF CONTAMINANTS IN THE GROUND WATER PRIOR TO DEEP WELL INJECTION.

ORGANIC COMPOUNDS WOULD BE REMOVED BY STRIPPING AND CARBON ABSORPTION. IF RESIDUALS FROM THIS TREATMENT ARE INCINERATED, THIS WOULD PROVIDE PERMANENT TREATMENT OF THESE CONTAMINANTS. IF THEY ARE LANDFILLED, THE DISPOSAL MAY NOT BE CONSIDERED ANY MORE PERMANENT THAN DEEP WELL INJECTION WITHOUT TREATMENT. IF CYANIDE TREATMENT IS REQUIRED, A CHLORINATION PROCESS MAY BE USED, WHICH SHOULD PERMANENTLY DESTROY THE CYANIDE. METALS MAY BE REMOVED BY PRECIPITATION. THE METALS SLUDGE WOULD BE LANDFILLED BUT MAY REQUIRE SOLIDIFICATION FIRST. THIS DISPOSAL MAY NOT BE CONSIDERED MORE PERMANENT THAN DEEP WELL INJECTION WITHOUT TREATMENT.

REINJECTION INTO THE CALUMET AQUIFER WOULD BE ACCEPTABLE TO US EPA IF IT MEETS CALS AND IS CONDUCTED IN A MANNER THAT WILL NOT SPREAD THE SALT PLUME. HOWEVER, DEEP WELL INJECTION IS PREFERABLE BECAUSE IT WOULD REMOVE THE SALT CONTAMINATION FROM A USABLE AQUIFER.

THE EVAPORATION ALTERNATIVE (4E) WOULD REDUCE THE VOLUME OF ALL CONTAMINANTS AND THE TOXICITY OF CONTAMINANTS IN THE BLOW DOWN BY INCINERATION. HOWEVER, EXTENSIVE TREATMENT OF THE SALT CAKE WOULD LIKELY BE REQUIRED PRIOR TO LAND DISPOSAL UNDER THE RCRA LAND DISPOSAL RESTRICTIONS. IF SUCH TREATMENT IS NOT REQUIRED, ALTERNATIVE 4E WOULD INCLUDE DISPOSAL OF SIGNIFICANT QUANTITIES OF HAZARDOUS WASTES IN OFF-SITE LANDFILLS.

THE DEEP WELL INJECTION WITHOUT TREATMENT ALTERNATIVE (4A) WOULD NOT REDUCE TMV OF CONTAMINANTS IN THE GROUND WATER. HOWEVER, IF A PETITION TO ALLOW LAND DISPOSAL IS APPROVED BY US EPA, THIS ALTERNATIVE SHOULD PROVIDE PERMANENT HUMAN HEALTH AND ENVIRONMENTAL PROTECTION SINCE THE PETITION MUST DEMONSTRATE THAT THERE WILL BE NO MIGRATION FROM THE INJECTION ZONE WHILE THE WASTES REMAIN HAZARDOUS. IN ADDITION, ALTERNATIVE 4A IS CONSIDERABLY LESS EXPENSIVE THAN ALTERNATIVE 4C.

#SR

X. THE SELECTED REMEDY

US EPA SELECTS EITHER ALTERNATIVE 7 OR 8 FOR IMPLEMENTATION AT MIDCO I. THESE ALTERNATIVES ARE DESCRIBED IN SECTIONS XIII AND IX. ALTERNATIVE 7 WILL BE IMPLEMENTED IF A PETITION TO ALLOW INJECTION OF WASTE PROHIBITED UNDER 40 CFR PART 148 SUBPART B IS APPROVED BY US EPA. IN THIS CASE, THE PERMANENCE OF THE REMEDIAL ACTION WOULD BE CONSIDERED EQUIVALENT TO ALTERNATIVE 8, AND ALTERNATIVE 7 IS LESS EXPENSIVE. IF A PETITION IS NOT

APPROVED, ALTERNATIVE 8 MUST BE IMPLEMENTED. ALTERNATIVE 8 MAY INCLUDE DEEP WELL INJECTION OF THE SALT CONTAMINATED GROUND WATER OR REINJECTION OF THE GROUND WATER INTO THE CALUMET AQUIFER.

THE SELECTED ALTERNATIVE WILL ALSO INCLUDE SITE ACCESS RESTRICTIONS AND DEED RESTRICTIONS, AS APPROPRIATE. EITHER ALTERNATIVE WILL INCLUDE TREATMENT OF THE SOURCE BY A COMBINATION OF SVE AND S/S. THIS IS THE LEAST EXPENSIVE ALTERNATIVE THAT WILL PERMANENTLY REDUCE TMV OF THE SOURCE, AND BE FULLY PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT. HOWEVER, IMPLEMENTATION OF THIS SOURCE REMEDIAL ACTION DEPENDS ON THE RESULTS OF THE TREATABILITY TESTS FOR S/S. IF THE TREATABILITY TESTS SHOW THAT S/S WILL NOT PROVIDE A SIGNIFICANT REDUCTION IN MOBILITY OF THE HAZARDOUS SUBSTANCES OF CONCERN, THE ROD WILL BE REOPENED AND A DIFFERENT SOURCE CONTROL MEASURE WILL BE SELECTED. A MORE DETAILED COST BREAKDOWN FOR THESE ALTERNATIVES IS IN TABLES 15 AND 16 IN THE APPENDIX.

CLEAN UP ACTION LEVELS (CALs):

SOIL CLEAN UP ACTION LEVELS:

ALL SUBSURFACE MATERIALS AFFECTED BY THE SITE OR BY MIDCO OPERATIONS THAT EXCEED ANY OF THE FOLLOWING RISK-BASED LEVELS WILL BE TREATED:

CUMULATIVE LIFETIME CARCINOGENIC RISK	= 1×10^{-6}
CUMULATIVE CHRONIC NONCARCINOGENIC INDEX	= 1.0
SUBCHRONIC RISK INDEX	= 1.0

IN ADDITION, CONTAMINATED SURFACE SEDIMENTS WITHIN THE AREA SHOWN IN FIGURE 14 THAT EXCEED THE ABOVE LEVELS WILL BE EXCAVATED AND TREATED.

GROUND WATER CLEAN UP ACTION LEVELS:

ALL PORTIONS OF THE CALUMET AQUIFER AFFECTED BY THE SITE OR BY MIDCO OPERATIONS THAT EXCEED ANY OF FOLLOWING RISK-BASED LEVELS WILL BE RECOVERED AND TREATED (EXCEPT AS PROVIDED FOR IN THE SUBSEQUENT DISCUSSION). THE GROUND WATER PUMPING, TREATMENT AND DISPOSAL SYSTEM SHALL CONTINUE TO OPERATE UNTIL THE HAZARDOUS SUBSTANCES IN ALL PORTIONS OF THE CALUMET AQUIFER AFFECTED BY THE SITE OR BY MIDCO OPERATIONS ARE REDUCED BELOW EACH OF THESE RISK-BASED LEVELS (EXCEPT AS PROVIDED FOR IN THE SUBSEQUENT DISCUSSION). APPLYING THE CALS THROUGHOUT THE CONTAMINATED PLUME IS CONSISTENT WITH FR, VOL 53, NO 245, P 51426.

CUMULATIVE LIFETIME CARCINOGENIC RISK	= 1×10^{-5}
CUMULATIVE NONCARCINOGENIC INDEX	= 1.0
SUBCHRONIC RISK	= 1.0
PRIMARY MCLS (40 CFR 141)	
CHRONIC AWQC FOR PROTECTION OF AQUATIC LIFE MULTIPLIED BY A FACTOR OF 3.9 (TO ACCOUNT FOR DILUTION)	

EVALUATION OF ATTAINMENT OF CALs:

THE RISK LEVELS WILL BE CALCULATED FROM THE SOIL AND GROUND WATER ANALYTICAL RESULTS USING THE ASSUMPTIONS LISTED IN TABLES 2, 3, 4 AND 5 IN THE APPENDIX (EXCEPT THAT IN PLACE OF THE AVERAGE SITE CONCENTRATION, ACTUAL MEASURED SOIL AND GROUND WATER CONCENTRATIONS IN EACH SAMPLE LOCATION WILL BE USED, AND SOIL INGESTION RATES FOR CHRONIC EXPOSURES OF 0.2 GRAM PER DAY FOR AGES 1-6 AND 0.1 GRAM PER DAY FOR OLDER AGE GROUPS WILL BE USED), THE PROCEDURES IN THE SUPERFUND PUBLIC HEALTH EVALUATION MANUAL AND US EPA'S MOST RECENTLY PUBLISHED CARCINOGENIC POTENCY FACTORS AND REFERENCE DOSES.

FOR INORGANIC COMPOUNDS IN GROUND WATER, THE ANALYTICAL RESULTS FROM FILTERED SAMPLES WILL BE USED. THE ANALYTICAL PROCEDURES WILL AT LEAST REACH THE ANALYTICAL DETECTION LIMITS LISTED IN TABLES 17 AND 18 IN THE APPENDIX. CONSTITUENTS THAT ARE NOT DETECTED SHALL NOT BE INCLUDED IN RISK CALCULATIONS. CONSTITUENTS THAT ARE DETECTED BELOW BACKGROUND CONCENTRATIONS IDENTIFIED IN TABLES 17 AND 18 SHALL NOT BE INCLUDED IN THE RISK CALCULATIONS.

IF ONLY ONE CONSTITUENT IS DETECTED IN GROUND WATER AT A CONCENTRATION THAT IS CALCULATED TO POTENTIALLY CAUSE A LIFETIME, INCREMENTAL CARCINOGENIC RISK OF 1×10^{-5} OR GREATER, AND AN MCL HAS BEEN PROMULGATED FOR THIS CONSTITUENT PURSUANT TO 40 CFR 141, THEN THE MCL WILL BE THE CAL FOR THAT CONSTITUENT. IN ADDITION, THAT CONSTITUENT WILL NOT BE USED IN THE CUMULATIVE RISK CALCULATION.

JUSTIFICATION FOR USE OF 10-5 RISK LEVEL:

USE OF THE 1×10^{-5} LIFETIME, CUMULATIVE CARCINOGENIC RISK LEVEL IS RECOMMENDED FOR THE GROUND WATER CAL AS OPPOSED TO THE 1×10^{-6} LEVEL BECAUSE THERE ARE MULTIPLE CONTAMINANT SOURCES THAT ARE AFFECTING THE CALUMET AQUIFER IN THE VICINITY OF THE SITE. IN ADDITION, THE 10^{-6} LEVEL IS GENERALLY WELL BELOW THE ANALYTICAL DETECTION LIMITS FOR THE CONSTITUENTS OF CONCERN.

CRITERIA FOR CONTROL OF AIR EMISSIONS:

EACH SEPARATE SOURCE OF AIR EMISSIONS SHALL BE CONTROLLED TO PREVENT EXPOSURES TO THE NEAREST RESIDENT AND WORKERS ON ADJACENT PROPERTIES FROM CAUSING AN ESTIMATED CUMULATIVE, INCREMENTAL, LIFETIME CARCINOGENIC RISK EXCEEDING 1×10^{-7} . SINCE THERE ARE MULTIPLE OPERATIONS THAT CAUSE AIR EMISSIONS, EACH MUST BE CONTROLLED TO THE 1×10^{-7} CARCINOGENIC RISK LEVEL TO ASSURE THAT THE TOTAL RISK WILL BE LESS THAN 1×10^{-6} . THE FOLLOWING OPERATIONS WILL BE CONSIDERED SEPARATE SOURCES:

1. SUBSURFACE SOIL EXCAVATION AND HANDLING;
2. EMISSION FROM SVE;
3. EMISSIONS FROM S/S;
4. EMISSIONS FROM GROUND WATER TREATMENT.

THE RISK LEVELS WILL BE CALCULATED USING CONSERVATIVE ASSUMPTIONS, THE PROCEDURES IN THE US EPA PUBLIC HEALTH EVALUATION MANUAL AND EXPOSURE ASSESSMENT MANUAL, AND THE MOST RECENT US EPA PUBLISHED CARCINOGENIC POTENCY FACTOR. THE EMISSIONS MUST ALSO BE CONTROLLED TO PREVENT ANY NON-CARCINOGENIC RISK EITHER ON-SITE OR OFF-SITE. FUGITIVE DUST MUST BE CONTROLLED IN COMPLIANCE WITH STATE OF INDIANA REQUIREMENTS.

CRITERIA FOR DISCONTINUATION OF SOIL VAPOR EXTRACTION SYSTEM:

THE SOIL VAPOR EXTRACTION SYSTEM SHALL BE OPERATED UNTIL THE FOLLOWING CRITERIA IS MET:

1. UNTIL THE SOLIDIFICATION OPERATION WILL MEET THE CRITERIA FOR AIR EMISSION DEFINED ABOVE;
2. IF SOILS ARE EXCAVATED AND SOLIDIFIED, UNTIL APPLICABLE TREATMENT STANDARDS FOR VOCs IN 40 CFR 268 WILL BE MET FOLLOWING SOLIDIFICATION;
3. IF SOILS ARE SOLIDIFIED IN-SITU; UNTIL GROUND WATER CALS WILL NOT BE EXCEEDED DUE TO LEACHING OF VOC'S FROM THE SOLIDIFIED MASS.

THE SELECTED REMEDIAL ACTIONS WILL BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, WILL ATTAIN APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL AND STATE REQUIREMENTS AND ARE COST EFFECTIVE. THE REMEDY SATISFIES THE STATUTORY PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT THAT REDUCES TOXICITY, MOBILITY OR VOLUME AS A PRINCIPAL ELEMENT AND UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE.

THE STATE OF INDIANA IS EXPECTED TO CONCUR WITH THE SELECTED REMEDIAL ACTIONS. ALTHOUGH THERE IS SOME PUBLIC CONCERN ABOUT THE DEEP WELL INJECTION OPERATION, IT IS BELIEVED THAT THE PROTECTIVE MEASURES REQUIRED IN US EPA'S UNDERGROUND INJECTION CONTROL PROGRAM COUPLED WITH SOURCE (SOIL) TREATMENT PROVIDE A MORE ACCEPTABLE TECHNOLOGY FOR THE COMMUNITY THAN THE FURTHER DEGRADATION OF THE EXISTING CALUMET AQUIFER OR THE GRAND CALUMET RIVER.

BECAUSE THE REMEDY WILL RESULT IN HAZARDOUS SUBSTANCES REMAINING ON-SITE ABOVE HEALTH-BASED LEVELS, A REVIEW WILL BE CONDUCTED WITHIN FIVE YEARS AFTER COMMENCEMENT OF REMEDIAL ACTIONS TO ENSURE THAT THE REMEDY CONTINUES TO PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT.

TABLE 13

MIDCO I
ESTIMATED COSTS IN MILLIONS OF DOLLARS
AND TIME TO IMPLEMENT

ALTERNATIVE	PRESENT WORTH	CAPITAL COST	ANNUAL O&M COST	YEARS TO DESIGN AND CONSTRUCT	YEARS TO COMPLETE ACTION
1. NO ACTION	0	0	0	0	0
2. CAP	3.4	2.0	0.15	2	1
3. CONTAINMENT	4.7	3.2	0.16	3	2
REMEDIES THAT DIRECTLY ADDRESS GROUNDWATER					
4A. DEEP WELL	5.5	3.8	0.19	4	30
4C. TREAT AND DEEP WELL	8.8	3.9	0.53	3	30
4E. EVAPORATION	6.5	2.3	0.45	3	30
REMEDIES THAT DIRECTLY ADDRESS SOURCE					
5A. LANDFILL	9.7	8.3	0.15	2	2
5C. INCINERATION	13.6	12.2	0.15	4	4
5E. SOLIDIFICATION	7.6	6.2	0.15	2	2
5G. VITRIFICATION	10.2	8.9	0.15	3	3
REMEDIES THAT DIRECTLY ADDRESS SOURCE AND GROUNDWATER					
6. COMBINES 5E WITH 3	10.2	8.7	0.16	3	3
7. COMBINES 5E WITH 4A	10.7	9.0	0.19	4	30
8. COMBINES 5E12 WITH 4C	14.0	9.1	0.53	4	30
9. COMBINES 5E1 WITH 4E	11.8	7.5	0.45	4	30
1. EXCAVATION FOR THESE ALTERNATIVES IS PRECEDED BY IN-SITU VAPOR EXTRACTION.					
2. COSTS ARE FOR TREATMENT TO DRINKING WATER STANDARDS PRIOR TO DEEP WELL INJECTION. IF ONLY TREATMENT TO LAND DISPOSAL RESTRICTION TREATMENT STANDARDS ARE REQUIRED, COST ESTIMATE IS \$800,000 LESS.					

MIDCO I
TABLE OF EFFECTIVENESS AND IMPLEMENTABILITY

ALTERNATIVE	WILL CONTAMINANTS MIGRATE OFF-SITE IN GROUND WATER?	WILL ACTION RESULT IN NON-COMPLIANCE WITH STATE OR FEDERAL STANDARDS?
1. NO ACTION	YES	YES
2. CAP	YES	YES
3. CONTAINMENT	NO	NO
REMEDIES THAT DIRECTLY ADDRESS GROUNDWATER		
4A. DEEP WELL	NO	NO
4C. TREAT AND DEEP WELL	NO	NO
4E. EVAPORATION	NO	NO
REMEDIES THAT DIRECTLY ADDRESS SOURCE		
5A. LANDFILL*	YES	YES
5C. INCINERATION*	YES	YES
5E. SOLIDIFICATION*	YES	YES
5G. VITRIFICATION	YES	YES
REMEDIES THAT DIRECTLY ADDRESS SOURCE AND GROUNDWATER		
6. (5E + 3)*	NO	NO
7. (5E + 4A)*	NO	NO
8. (5E + 4C)*	NO	NO
9. (5E + 4E)*	NO	NO

* EXCAVATION FOR THESE ALTERNATIVES IS PRECEDED BY IN-SITU VAPOR EXTRACTION.

1. HAZARDOUS WASTE DISPOSAL IN DEEP AQUIFER.
2. SMALL AMOUNTS OF PRECIPITATED METALS AND SPENT CARBON MAY BE LANDFILLED.
3. SALT CAKE CONTAMINATED WITH METALS, CYANIDE AND SOME ORGANICS WILL BE LANDFILLED. ORGANIC LIQUIDS WILL BE INCINERATED.
4. SMALL AMOUNTS OF LIQUIDS FROM IN-SITU VAPOR EXTRACTION WILL BE INCINERATED.
5. APPROVAL UNDER CERCLA IS UNLIKELY.
6. THE LONG TERM EFFECTIVENESS OF THE SLURRY WALL IS UNCERTAIN.
7. MAY BE PROBLEMS OBTAINING APPROVAL FOR DEEP WELL INJECTION.
8. GROUND WATER USAGE RESTRICTIONS DIFFICULT TO IMPLEMENT.
9. PROCEDURES ARE NOT PROVEN IN A FULL SCALE PROJECT. HIGH WATER TABLE MAY CAUSE DIFFICULTIES DURING CONSTRUCTION.

MIDCO I
TABLE OF EFFECTIVENESS AND IMPLEMENTABILITY

ALTERNATIVE	WILL CONTAMINANTS OF POTENTIAL HEALTH CONCERN REMAIN IN THE SOIL OR GROUND WATER?	WILL A SIGNIFICANT AMOUNT OF OFF-SITE HAZARDOUS WASTE DISPOSAL OCCUR?
-------------	--	--

1. NO ACTION	YES	NO
--------------	-----	----

2. CAP	YES	NO
--------	-----	----

3. CONTAINMENT	YES	NO
----------------	-----	----

REMEDIES THAT DIRECTLY ADDRESS GROUNDWATER

4A. DEEP WELL	YES	NO1
---------------	-----	-----

4C. TREAT AND DEEP WELL	YES	NO2
----------------------------	-----	-----

4E. EVAPORATION	YES	YES3
-----------------	-----	------

REMEDIES THAT DIRECTLY ADDRESS SOURCE

5A. LANDFILL*	YES	YES
---------------	-----	-----

5C. INCINERATION*	YES	NO4
-------------------	-----	-----

5E. SOLIDIFICATION*	YES	NO4
---------------------	-----	-----

5G. VITRIFICATION	YES	NO
-------------------	-----	----

REMEDIES THAT DIRECTLY ADDRESS SOURCE AND GROUNDWATER

6. (5E + 3)*	YES	NO4
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7. (5E + 4A)*	NO	NO14
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8. (5E + 4C)*	NO	NO42
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9. (5E + 4E)*	NO	YES34
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* EXCAVATION FOR THESE ALTERNATIVES IS PRECEDED BY IN-SITU VAPOR EXTRACTION.

1. HAZARDOUS WASTE DISPOSAL IN DEEP AQUIFER.
2. SMALL AMOUNTS OF PRECIPITATED METALS AND SPENT CARBON MAY BE LANDFILLED.
3. SALT CAKE CONTAMINATED WITH METALS, CYANIDE AND SOME ORGANICS WILL BE LANDFILLED. ORGANIC LIQUIDS WILL BE INCINERATED.
4. SMALL AMOUNTS OF LIQUIDS FROM IN-SITU VAPOR EXTRACTION WILL BE INCINERATED.
5. APPROVAL UNDER CERCLA IS UNLIKELY.
6. THE LONG TERM EFFECTIVENESS OF THE SLURRY WALL IS UNCERTAIN.
7. MAY BE PROBLEMS OBTAINING APPROVAL FOR DEEP WELL INJECTION.
8. GROUND WATER USAGE RESTRICTIONS DIFFICULT TO IMPLEMENT.
9. PROCEDURES ARE NOT PROVEN IN A FULL SCALE PROJECT. HIGH WATER TABLE MAY CAUSE DIFFICULTIES DURING CONSTRUCTION.

MIDCO I
TABLE OF EFFECTIVENESS AND IMPLEMENTABILITY

ARE
SIGNIFICANT
IMPLEMENTATION
PROBLEMS EXPECTED?

1. NO ACTION	YES58
2. CAP	YES58
3. CONTAINMENT	NO6

REMEDIES THAT DIRECTLY ADDRESS GROUNDWATER

4A. DEEP WELL	NO7
4C. TREAT AND DEEP WELL	NO
4E. EVAPORATION	NO

REMEDIES THAT DIRECTLY ADDRESS SOURCE

5A. LANDFILL*	YES8
5C. INCINERATION*	YES8
5E. SOLIDIFICATION*	YES8
5G. VITRIFICATION	YES89

REMEDIES THAT DIRECTLY ADDRESS SOURCE AND GROUNDWATER

6. (5E + 3)*	NO
7. (5E + 4A)*	NO7
8. (5E + 4C)*	NO
9. (5E + 4E)*	NO

* EXCAVATION FOR THESE ALTERNATIVES IS PRECEDED BY IN-SITU VAPOR EXTRACTION.

1. HAZARDOUS WASTE DISPOSAL IN DEEP AQUIFER.
2. SMALL AMOUNTS OF PRECIPITATED METALS AND SPENT CARBON MAY BE LANDFILLED.
3. SALT CAKE CONTAMINATED WITH METALS, CYANIDE AND SOME ORGANICS WILL BE LANDFILLED. ORGANIC LIQUIDS WILL BE INCINERATED.
4. SMALL AMOUNTS OF LIQUIDS FROM IN-SITU VAPOR EXTRACTION WILL BE INCINERATED.
5. APPROVAL UNDER CERCLA IS UNLIKELY.
6. THE LONG TERM EFFECTIVENESS OF THE SLURRY WALL IS UNCERTAIN.
7. MAY BE PROBLEMS OBTAINING APPROVAL FOR DEEP WELL INJECTION.
8. GROUND WATER USAGE RESTRICTIONS DIFFICULT TO IMPLEMENT.
9. PROCEDURES ARE NOT PROVEN IN A FULL SCALE PROJECT. HIGH WATER TABLE MAY CAUSE DIFFICULTIES DURING CONSTRUCTION.

TABLE 9
COMPARISON OF CONCENTRATIONS OF INORGANICS IN SUBSURFACE MATERIAL
AT MIDCO I WITH CONCENTRATIONS IN LISTED HAZARDOUS WASTES (FROM
BDAT BACKGROUND DOCUMENTS FOR THE FIRST THIRD WASTES UNDER LAND BAN)

CONSTITUENT CONCENTRATIONS (MG/KG)				
SOURCE	ARSENIC	CHROMIUM	LEAD	CADMIUM
K101	590-1950			
K102	3060-8320			
K061		1730	20300	44
K046			967	
K048		0.04-3435	0.05-1250	
K049		28.9-1400	21.95-3900	
K050		11-1600		
K051		0.1-6790	0.25-2480	
K052			11-5800	
MIDCO I ON-SITE SOILS	ND-49	2.2-10200	2.8-4980	ND-12

TABLE 19

**LAND DISPOSAL RESTRICTION TREATMENT STANDARDS FOR WASTE
CATEGORIES F001, F002, F003, F005 (FROM 40 CFR 268.41)**

CONSTITUENT	CONCENTRATIONS IN EXTRACT MG/L	
	WASTEWATERS	NON-WASTEWATERS*
ACETONE	0.05	0.59
N-BUTYL ALCOHOL	5.0	5.0
CARBON DISULFIDE	1.05	4.81
CARBON TETRACHLORIDE	0.15	0.96
CHLOROBENZENE	0.15	0.05
CYCLOHEXANONE	0.125	0.75
1,2 DICHLOROBENZENE	0.65	0.125
ETHYL ACETATE	0.05	0.75
ETHYL BENZENE	0.05	0.053
ETHYL ETHER	0.05	0.75
ISOBUTANOL	5.0	5.0
METHANOL	0.25	0.75
METHYLENE CHLORIDE	0.20	0.96
METHYL ETHYL KETONE	0.05	0.75
METHYL ISOBUTYL KETONE	0.05	0.33
PYRIDINE	1.12	0.33
TETRACHLOROETHYLENE	0.079	0.05
TOLUENE	1.12	0.33
1,1,1-TRICHLOROETHANE	1.05	0.41
1,1,2-TRICHLORO-1,2,2		
TRIFLUOROETHANE	1.05	0.96
TRICHLOROETHYLENE	0.065	0.091
TRICHLOROFLOUROMETHANE	0.05	0.96
XYLENE	0.05	0.15

*A CAPACITY VARIANCE IS IN EFFECT FOR SOIL WASTE AND DEBRIS UNTIL
NOVEMBER 1990.

TABLE 20

PROPOSED LAND RESTRICTION TREATMENT STANDARDS
FOR WASTE CATEGORIES F007, F008, F009,
(FROM FR, VOL, 53, NO. 7, P. 1068)

WASTEWATERS:

CONSTITUENT	TOTAL COMPOSITION (MG/L)	TCLP (MG/L)
CYANIDE (TOTAL)	12	
CYANIDE (AMENABLE)	1.3	
CHROMIUM	0.32	
LEAD	0.04	
NICKEL	0.44	

NONWASTEWATERS:

	(MG/KG)	(MG/L)
CYANIDES (TOTAL)	110	
CYANIDES (AMENABLE)	0.064	
CADIUM		0.066
CHROMIUM		5.2
LEAD		0.51
NICKEL		0.32
SILVER		0.072